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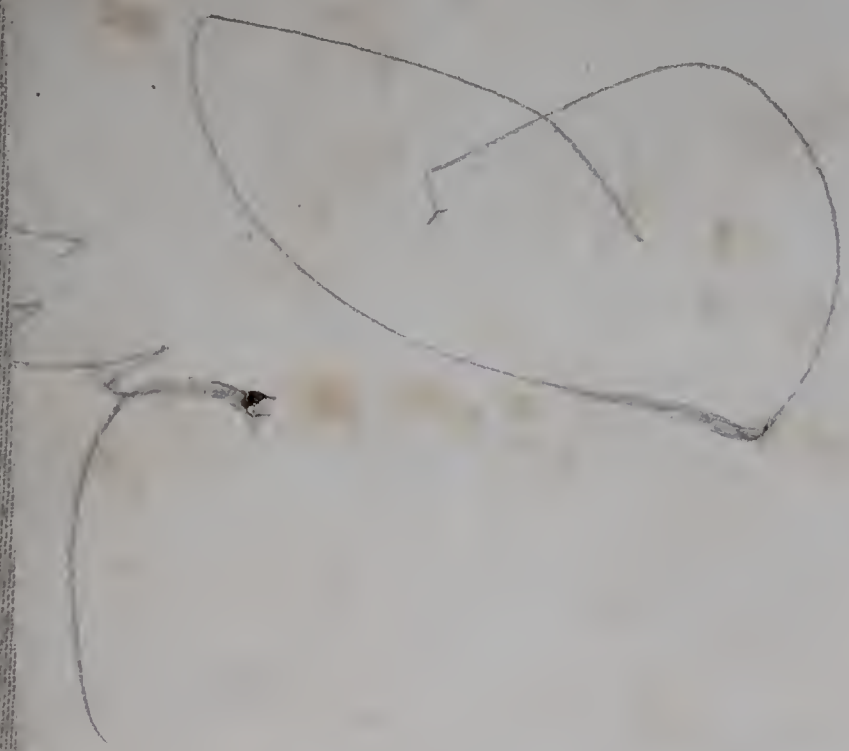

THE

NATURAL HISTORY

OF THE

HUMAN TEETH:

EXPLAINING THEIR

STRUCTURE, USE, FORMATION, GROWTH, AND DISEASES.

ILLUSTRATED WITH COPPER-PLATES.

TO WHICH IS ADDED,

A

PRACTICAL TREATISE on the DISEASES of the TEETH.

BY JOHN HUNTER,

SURGEON EXTRAORDINARY TO THE KING, AND FELLOW OF THE ROYAL SOCIETY.

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ADVERTISEMENT.

MOST of the Observations contained in the following Treatise were made by the Author before the year 1755; and the substance of them constantly demonstrated after that period, in Doctor Hunter's Course of Anatomical Lectures. The Figures were drawn by Mr. Rymsdyk, under the Author's direction, and engraved by Messrs. Strange, Grignion, Ryland, and others.

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PART

PART THE FIRST.

OF THE
UPPER JAW.

BEFORE we enter into a description of the Teeth themselves, it will be necessary to give an account of the Upper and Lower Jaw-bones, in which they are inserted; insisting minutely on those parts which are connected with the Teeth, or serve for their motion and action, and passing over the others slightly.

The Upper Jaw is composed of two bones, which generally remain distinct through life. They are very irregular at their posterior and upper parts, sending upwards and backwards a great many processes, that are connected with the bones of the Face and Skull *. The lower and anterior parts of the Upper Jaw are more uniform, making a kind of a circular sweep from side to side, the convexity of which is turned forwards; the lower part terminates in a thick edge, full of

* Vide Plate III. Fig. 1st and 2d. AA.

of the sockets for the Teeth. This edge is called in each bone the Alveolar Process*. Behind the Alveolar Processes there are two horizontal lamellæ, which, uniting together, form part of the roof of the Mouth, which is the partition between the Mouth and the Nose †.

This plate, or partition, is situated about half an inch higher than the lower edge of the Alveolar Process; and this gives the roof of the Mouth a considerable hollowness.

The use of the Upper Jaw is to form part of the Parieties of the Mouth, Nose, and Orbits; to give a basis, or supply the Alveolar Process, for the superior row of Teeth, and to counteract the Lower Jaw: but it has no motion itself upon the bones of the Head and Face.

* Vide Plate I. Fig. 1. *a*, *b*, *c*, *d*.

† Vide Plate I. Fig. 1. *e*, *e*.

O*H*SPENCER,M*D.

OF THE

LOWER JAW.

As the Lower Jaw is extremely moveable, and its motion is indispensably necessary in all the various operations of the Teeth, it requires to be more particularly described. It is much more simple in its form than the Upper, having fewer processes, and these not so irregular. Its anterior circular part is placed directly under that of the Upper Jaw; but its other parts extend farther backwards*.

This Jaw is at first composed of two distinct bones†; but these, soon after birth, unite into one, at the middle of the chin. This union is called the Symphysis of the Jaw. Upon the upper edge of the body of the bone is placed the Alveolar Process, a good deal similar to that of the Upper Jaw. The Alveolar Process extends àll round the upper part of the bone, from the Coronoide Process of one side to that of the other ‡. In both Jaws they are every where relatively propor-

* Vide Plate III. Fig. 1 and 2.
† Vide Plate VIII. Fig. 1, 4, and 6.
‡ Vide Plate I. Fig. 2.

tional to the Teeth; being thicker behind, where the Teeth are larger, and more irregular, upon account of the more numerous fangs inserted into them. The Teeth that are situated backwards, in the Upper Jaw, have more fangs than those that correspond with them in the lower, and the sockets are accordingly more irregular. The Alveolar Process of the Upper Jaw is a section of a larger circle than that of the lower, especially when the Teeth are in the sockets. This arises chiefly from the anterior Teeth in the Upper Jaw being broader and flatter than those in the Lower *. The posterior part of the bone on each side rises almost perpendicularly, and terminates above in two processes †; the anterior of which is the highest, is thin and pointed, and is called the Coronoide Process ‡. The anterior edge of this process forms a ridge which goes obliquely downward and forward on the Jaw, upon the outside of the posterior sockets §. To this process the Temporal Muscle is attached; and as it rises above the centre of motion, that Muscle acts with nearly equal advantage in all the different situations of the Jaw.

The Posterior Process, which is made for a moveable articulation with the head, runs upward, and a little

* Vide Plates I. and III.
† Vide Plate III. Fig. 2. *e*; and Plate IV. Fig. 2.
‡ Vide Plate IV. *i i*.
§ Vide Plate IV. Fig. 2. B.

little backward; is narrower, thicker, and shorter than the anterior; and terminates in an oblong rounded head, or Condyle *, whose longest axis is nearly transverse. The Condyle is bended a little forward; is rounded, or convex, from the fore to the back part; and likewise a little rounded from one end to the other, or from right to left. Its external end is turned a little forward, and its internal a little backward; so that the axis of the two Condyles are neither in the same straight line, nor parallel to each other; but the axis of each Condyle, if continued backwards, would meet, and form an angle of about one hundred and forty-six degrees; and lines drawn from the Symphysis of the Chin, to the middle of the Condyle, would intersect their longest axis, at nearly right angles †. There are, however, some exceptions; for in a Lower Jaw, of which I have a drawing, the angle formed by the supposed continuation of the two axes, instead of being an angle of one hundred and forty-six degrees, is of one hundred and ten only. The Lower Jaw serves for a base to support the Teeth in the Alveolar Process, during their action on those of the Upper Jaw in mastication; and to give origin to some muscles that belong to other parts.

* Vide Plate IV. Fig. II. E.

† Vide Plate I. Fig. 2. or Plate IV. Fig. 2.

OF THE

ALVEOLAR PROCESSES.

THE Alveolar Processes are composed of two thin bony plates, one external*, and the other internal†. These two plates are at a greater distance from each other at their posterior ends, than at the anterior or middle part of the Jaw. They are united together by thin bony partitions going across, which divide the processes at the anterior part, into just as many distinct sockets as there are Teeth‡; but at the posterior part, where the Teeth have more than one root, or fang, there are distinct cells, or sockets, for every root§. These transverse partitions are more protuberant than the Alveolar Plates; and thus add laterally to the depth of the cells, particularly at the anterior part of the Jaw. At each partition, the external plate of the Alveolar Process is depressed, and forming furrows, or a fluting ‖ round the cells, or cavities,

* Vide Plate I. Fig. 1. *a, a, a, a, a.*
† Vide Plate I. Fig. 1. *b, b, b.*
‡ Vide Plate I. Fig. 1. *c, c,* and Fig. 2, *a.*
§ Vide Plate I. Fig. 1, *d, d.* and Fig. 2. *b, c.*
‖ Vide Plate III. Fig. 2. F F F F.

cavities, for the roots of the Teeth. This is observable in the whole length of the Alveolar Process of the Upper Jaw, and in the fore part particularly of the Lower Jaw. The Alveolar Processes of each Jaw form about one half of a circular, or rather of an elliptical * figure; and at the fore part in the Lower Jaw they are perpendicular, but project inwards at the posterior part, and describe a smaller circle than the body of the bone upon which they stand †; as we shall observe more particularly hereafter, when we come to treat of the Jaws of Old People

The Alveolar Processes of both Jaws should rather be considered as belonging to the Teeth, than as parts of the Jaws; for they begin to be formed with the Teeth, keep pace with them in their growth, and decay, and entirely disappear, when the Teeth fall; so that, if we had no Teeth, it is likely we should not only have no sockets, but not even these processes, in which the sockets are formed; and the Jaws can perform their motions, and give origin to muscles, without either the Teeth, or Alveolar Processes. In short, there is such a mutual dependence of the Teeth and Alveolar Processes on each other, that the destruction of the one seems to be always attended with that of the other.

In

* Vide Plate I. Fig. 1. and 2.

† Vide Plate I. Fig. 2.

In the head of a young subject which I examined, I found that the two first Incisor Teeth in the Upper Jaw had not cut the Gum; nor had they any root, or fang, excepting so much as was necessary to fasten them to the Gum, on their upper surface; and on examining the Jaw, I found there was no Alveolar Process, nor sockets, in that part. What had been the cause of this, I will not pretend to say: whether it was owing to the Teeth forming not in the Jaw, but in the Gum, or to the wasting of the fangs. The appearance of the Tooth favoured the first supposition; for it was not like those whose fangs are decayed in young subjects, in order to the shedding of the Teeth; and as it did not cut the Gum, it is reasonable to think it never had any fang. That end from which the fang should have grown, was formed into two round and smooth points, having each a small hole leading into the body of the Tooth, which was pretty well formed.

OF THE

ARTICULATION OF THE LOWER JAW.

JUST under the beginning of the Zygomatic Process of each Temporal Bone, before the external Meatus Auditorius, an oblong cavity may be observed; in direction, length, and breadth, in some measure corresponding with the Condyle of the Lower Jaw*. Before, and adjoining to this cavity, there is an oblong eminence, placed in the same direction, convex upon the top, in the direction of its shorter axis, which runs from behind forwards; and a little concave in the direction of its longer axis, which runs from within outwards. It is a little broader at its outer extremity; as the outer corresponding end of the Condyle describes a larger circle in its motion than the inner †. The surface of the cavity, and eminence, is covered with one continued smooth cartilaginous crust, which is somewhat ligamentous; for, by putrefaction, it peels off like a membrane, with the common Periosteum. Both the cavity and eminence serve for the motion

* Vide Plate II. L. and Plate IV. E E.

† Vide Plate II. K. and Plate XIV. F F.

tion of the Condyle of the Lower Jaw. The surface of the cavity is directed downward; that of the eminence downward and backward, in such a manner that a transverse section of both would represent the Italic letter *S* *. Though the eminence may, on a first view of it, appear to project considerably below the cavity, yet a line drawn from the bottom of the cavity to the most depending part of the eminence, is almost horizontal, and therefore nearly parallel with the line made by the grinding surfaces of the Teeth in the Upper Jaw: and when we consider the Articulation farther, we shall find that these two lines are so nearly parallel, that the Condyle moves almost directly forwards, in passing from the cavity to the eminence; and the parallelism of the motion is also preserved by the shape of an intermediate cartilage.

In this joint there is a moveable cartilage, which, though common to both Condyle and cavity, ought to be considered rather as an appendage of the former than of the latter, being more closely connected with it; so as to accompany it in its motion along the common surface of both the cavity and eminence. This cartilage is nearly of the same dimensions with the Condyle, which it covers; is hollowed on its inferior surface, to receive the Condyle: on its upper surface, it is more unequal, being moulded to the cavity and eminence of the articulating

* Vide Plate II. I, K.

ticulating surface of the Temporal Bone, though it is considerably less, and is therefore capable of being moved with the Condyle, from one part of that surface to another *. Its texture is ligamento-cartilagineous. This moveable cartilage is connected with both the Condyle of the Jaw and the articulating surface of the Temporal Bone, by distinct ligaments, arising from its edges all round. That by which it is attached to the Temporal Bone, is the most free and loose; though both ligaments will allow an easy motion, or sliding of the cartilage on the respective surfaces of the Condyle and Temporal Bone. These attachments of the cartilage are strengthened, and the whole articulation secured, by an external ligament, which is common to both, and which is fixed to the Temporal Bone, and to the neck of the Condyle. On the inner surface of the ligament, which attaches the cartilage to the Temporal Bone, and backwards, in the cavity, is placed what is commonly called the Gland of the Joint; at least, the ligament is there much more vascular than at any other part.

* Vide Plate II. L.

OF THE
MOTION IN THE JOINT OF THE LOWER JAW.

THE Lower Jaw, from the manner of its articulation, is susceptible of a great many motions.—The whole Jaw may be brought horizontally forwards by the Condyles sliding from the cavity towards the eminences on each side. This motion is performed chiefly when the Teeth of the Lower Jaw are brought directly under those of the Upper, in order to bite, or hold any thing very fast between them.

Or, the Condyles only may be brought forwards, while the rest of the Jaw is tilted backwards, as in the case when the Mouth is open; for on that occasion the angle of the Jaw is tilted backwards, and the chin moves downwards, and a little backwards also. In this last motion, the Condyle turns its face a little forwards; and the centre of motion lies a little below the Condyle, in the line between it and the angle of the Jaw. By such an advancement of the Condyles forwards, together with the rotation mentioned, the aperture of the Mouth may be considerably enlarged; a circumstance necessary on many obvious occasions.

The

The Condyles may also slide alternately backwards and forwards, from the cavity to the eminence, and *vice versa*; so that while one Condyle advances, the other moves backwards, turning the body of the Jaw from side to side, and thus grinding, between the Teeth, the morsel separated from the larger mass by the motion first described. In this case, the centre of motion lies exactly in the middle, between the two Condyles. And it is to be observed, that in these slidings of the Condyles forwards and backwards, the moveable cartilages do not accompany the Condyles in the whole extent of their motion; but only so far as to adapt their surfaces to the different inequalities of the Temporal Bone: for as these cartilages are hollow on their lower surfaces where they receive the Condyle, and on their opposite upper surfaces are convex where they lie in the cavity; but forwards, at the root of the eminence, that upper surface is a little hollowed; if they accompanied the Condyles through the whole extent of their motion, the eminences would be applied to the eminences, the cavities would not be filled up, and the whole articulation would be rendered very insecure.

This account of the motion of the Lower Jaw, and its cartilages, clearly demonstrates the principal use of these cartilages; namely, the security of the articulation: the surfaces of the cartilage accommodating them-

selves to the different inequalities, in the various and free motions of this joint. This cartilage is also very serviceable for preventing the parts from being hurt by the friction; a circumstance necessary to be guarded against, where there is so much motion. Accordingly, I find this cartilage in the different tribes of Carnivorous Animals, where there is no eminence and cavity, nor other apparatus for grinding; and where the motion is of the true ginglimus kind only.

In the Lower Jaw, as in all the joints of the body, when the motion is carried to its greatest extent, in any direction, the muscles and ligaments are strained, and the person made uneasy. The state, therefore, into which every joint most naturally falls, especially when we are asleep, is nearly in the middle, between the extremes of motion; by which means all the muscles and ligaments are equally relaxed. Thence it is, that commonly, and naturally, the Teeth of the two Jaws are not in contact; nor are the Condyles of the Lower Jaw so far back in the Temporal Cavities as they can go.

OF THE
MUSCLES OF THE LOWER JAW.

HAVING described the figure Articulation, Motion, and use of the Lower Jaw, it will be necessary, in the next place, to give some account of the Muscles that are the causes of its motion.

There are five pair of Muscles, each of them capable of producing various motions, according to the situation of the Lower Jaw, whether they act singly, or in conjunction with others; and two or more of them may be so situated as to be capable of moving the Jaw in the same direction; and every motion is produced by the action of more than one Muscle at a time. Thus, if the Jaw is depressed, and brought to one side, either the Masseter, Temporal, or Pterigoidæus internus of the opposite side will not only raise the Jaw, but bring it to its middle state. It will be necessary, in the description of each Muscle, to give its use in the different situations of the Jaw; by which means, after they are all described, their compound actions will be better understood. I shall first describe those which raise the Jaw; then those which give it the lateral motion; and,

lastly,

lastly, those which depress it; proceeding in each class as they rise in dissection.

The most superficial is the Masseter: it is situated upon the posterior and lower part of the Face, between the cheek-bone and angle of the Lower Jaw, directly before the lower part of the Ear. It is a thick, short complex Muscle, and a little flattened; it appears to have two distinct origins, an anterior outer, and a posterior inner; but that is owing only to its outer edge at its origin being slit, or double; and the fibres of these two edges having a different course, decussating each other a little. The anterior and outer portion of the Muscle begin to rise from a small part of the lower edge of the Malar Process of the Maxillary Bone, adjoining to the Os Malæ, and continues its origin all along the lower horizontal edge of this last bone, to the angle where its Zygomatic Process turns up to join that of the Temporal Bone. The external layer of fibres in this portion are tendinous at their beginnings, while the internal are fleshy.

The posterior and inner portion of this Muscle begins to rise partly tendinous, and partly fleshy, from the same lower edge of the Os Malæ; not where the origin of the other portion terminates, but a little farther forwards; and this origin is continued along the

the lower edge of the Zygomatic Process of the Temporal Bone, as far backwards as the eminence belonging to the articulation of the Lower Jaw.

From this extent of its origin, the Muscle passes downwards to its insertion into the Lower Jaw. The anterior external portion is broader at its insertion than at its origin; for it occupies a triangular space of the Lower Jaw above the angle, and on the outside, of about an inch in size, to about an inch and a half from the angle towards the Chin. In consequence of this extent of insertion, the fibres of this portion divaricate very considerably. They are mostly fleshy at their insertion, a few only being tendinous, particularly those that are inserted backwards. The posterior and inner portion of the Masseter is narrower at its insertion than at its origin; its posterior fibres running forwards as well as downwards, while its anterior run almost directly downwards. It occupies, in its insertion, the remaining part of the scabrous surface, above the angle of the Lower Jaw, which lies between the anterior portion and the two upper processes, viz. the Condyle and Coronoide. As the anterior fibres of this portion rise on the inside of the posterior fibres of the other portion; and as its posterior fibres run forwards as well as downwards, and its anterior run almost directly downwards, while the fibres of the other portion

tion radiate both forwards and backwards; these two portions in some measure decussate or cross one another. The anterior fibres, which run farthest and lowest down, are tendinous at their insertion, while the posterior and shortest are fleshy.

The use of the whole Muscle is to raise the Lower Jaw; and when it is brought forwards, the posterior and inner portion will assist in bringing it a little back; so that this Muscle becomes a rotator, if the Jaw happens to be turned to the opposite side.

We may observe, that this Muscle is intermixed with a number of tendinous portions, both at its origin and its insertion; which give rise to a greater number of fleshy fibres, and thereby add to the strength of the Muscle.

TEMPORALIS

TEMPORALIS.

IT is situated on the side of the Head, above, and somewhat before the Ear. It is a very pretty broad, flat, and radiated Muscle; broad and thin at its origin; narrow and thick at its insertion; and is covered with a pretty strong Fascia, above the Jugum.

This Fascia is fixed to the bones round the whole circumference of the origin of the Muscle. Above, it is fixed to a smooth white line, that is observable upon the Skull, extending from a little ridge on the lateral part of the Os Frontis, continued across the Parietal Bone, and making a turn towards the Mammillary Process. It is fixed below, to the ridge where the Zygomatic Process begins, just above the Meatus Auditorius; then to the upper edge of the Zygomatic Process itself, and anteriorly to the Os Malæ. This adhesion, anteriorly, above, and posteriorly, gives, as it were, the circumference of the origin of the Temporal Muscle.

This Muscle arises from all the bones of the side of the Head, that are within the line, for insertion of the tendinous Fascia, viz. from the lower and lateral part of the Parietal Bone, from all the squammous portion of

the Temporal Bone, from the lower and lateral part of the Os Frontis, from all the Temporal Process of the Os Sphenoides, and often from a process at the lower part of this surface (which portion, however, is often common to this Muscle, and the Pterygoidæus externus), and from the posterior surface of the Os Malæ. Outwardly, it rises from the inner surface of the Jugum, and from the whole inner surface of the Fascia above described. At this origin, from the Jugum, it is not to be distinguished from the Masseter, being there, in fact, one and the same Muscle; and indeed the Masseter is no more than a continuation of the same origin, under the edge of the Jugum; and might properly enough be reckoned the same, both as to its origin and insertion, and in some measure in its use also.

The origin is principally fleshy; and the Muscle passes from it, in general, downwards, and a little forwards, converging, and forming a thin middle tendon. After which the Muscle runs downwards, on the inside of the Jugum, and is inserted into the Coronoid Process of the Lower Jaw, on both sides tendinous and fleshy, but principally tendinous. It reaches farther down upon the inside of the Coronoid Process than upon the outer side, where the insertion is continued as low as the body of the bone.

The

The posterior and inferior edge of this Muscle passes over the root of the Zygomatic Process of the Temporal Bone, as over a pulley, which confines the action of the Muscle to that of raising the Lower Jaw, more than if its fibres had passed in a direct course from their origin to their insertion.

The use of the Temporal Muscle, in general, is to raise the Lower Jaw; and as it passes a little forwards to its insertion, it must bring the Condyle at the same time backwards, and so counteract the Pterygoidæus externus of the opposite side: and if both Muscles act, they counteract both the Pterygoidæi, by bringing back the whole of the Jaw.

PTERYGOIDÆUS INTERNUS.

IT is situated upon the inside of the Lower Jaw, opposite to the Masseter, which is upon the outside. It is a strong short Muscle, a little flattened, especially at its insertion. It arises tendinous and fleshy from the whole internal surface of the external Ala of the Sphenoid Bone; from the external surface of the internal Ala, near its bottom; from that process of the Os Palati that makes part of the Fossa Pterygoidæa; likewise from the anterior rounded surface of that process, where it is connected to the Os Maxillare superius. From thence the Muscle passes downwards, a little outwards and backwards, and is inserted tendinous and fleshy into the inside of the Lower Jaw, from the angle up almost to the groove, for the admission of the Maxillary Nerve, where the surface of the bone is remarkably scabrous.

The use of this Muscle is to raise the Lower Jaw; and from its direction, one would suspect that it would bring the Condyle a little forwards; but this motion is contrary to that of the Lower Jaw, for it is naturally brought back when raised.

PTERY-

PTERYGOIDÆUS EXTERNUS,

Is situated immediately between the external surface of the external Ala of the Pterygoid Process, and the Condyle of the Lower Jaw; lying, as it were, horizontally along the basis of the Skull. It is somewhat radiated in some bodies; broad at the origin, and small at the insertion; but the greater part of it forms a round, strong, fleshy belly; so that the part that makes it of the radiated kind is thin.

The thick and ordinary portion of it arises tendinous and fleshy, from almost the whole external surface of the external Ala of the Pterygoid Process of the Sphenoid Bone, excepting a little bit of the root at the posterior edge; and towards the lower part, it arises a little from the inner surface of that Ala. The thin portion arises from a ridge of the Sphenoid, that is continued from the process towards the Temple, just behind the Foramen Lacerum inferius, which terminates in a little protuberance. This origin is sometimes wanting; and in that case, the Temporal Muscle arises from that protuberance; and very often this origin is common to both. These two origins of this Muscle are sometimes so much separated as to make it a Biceps.

From

From these origins the Muscle passes outwards, and a little backwards, converging; that is, the superior fibres passing outwards and backwards, and a little downwards, while the inferior, or larger portion of it, passes a little upward.

It is inserted tendinous and fleshy into a depression on the anterior part of the Condyle and neck of the Lower Jaw, upon the inside of that ridge, which is continued from the Coronoid Process. Likewise a little portion into the anterior part of the moveable cartilage. A little portion is likewise inserted into the anterior part of the moveable cartilage of the joint.

When this Muscle acts singly, it is a rotator; for it brings the Condyle of the Jaw forwards, and likewise the moveable cartilage, which throws the Chin to the opposite side: but if it acts in conjunction with its fellow of the opposite side, instead of being turned to one side, the whole Jaw is brought forwards, and thus these counteract the Temporal, &c.

These two Muscles generally act alternately; and when they do so, one acts at the time of depression, the other at the time of elevation; so that these Muscles act, both when the Lower Jaw is raised, and when it is depressed: yet they do not assist either in raising or depressing it.

DIGASTRICUS.

IT is situated immediately under, and a little upon the inside of the Lower Jaw, and outside of the Fauces, extending from the Mastoid Process to the Chin, nearly along the angle made by the Neck and Chin, or Face *. The name of this Muscle expresses its general shape, as it has two fleshy bellies, and of course a middle tendon. Yet some of its anterior belly does not arise from the tendon of the posterior, but from the Fascia, which binds it to the Os Hyoides. These two fleshy bellies do not run in the same line, but form an angle, just where the tendon runs into the anterior belly; so that this tendon seems rather to belong to the posterior, which is the thickest and longest.

This Muscle arises from the Sulcus made by the inside of the Mastoid Process, and a ridge upon the Temporal Bone, where it is united with the Os Occipitis. The extent of this origin is about an inch: it is fleshy upon its outer part, viz. that from the Mastoid Process, and tendinous on the inside from the ridge. From its origin

* Vide Plate II. E. F.

origin it passes forwards, downwards, and a little inwards, much in the direction of the posterior edge of the Mammillary Process; and forms a round tendon first in its centre and upper surface. This tendon passes on in the same direction; and when got near the Os Hyoides, it commonly perforates the anterior end of the Stylo-Hyoidæus Muscle; and from the lower edge of this tendon, some fibres seem to go off, which degenerate into a kind of Fascia, that binds it to the Os Hyoides; and some of it goes across the lower part of the Mylo-Hyoidæus, and joins its fellow on the opposite side, binding the Os Hyoides by a kind of belt. At this part the tendon becomes a little broader, makes a turn upwards, inwards, and forwards, and gives origin to the anterior belly, which passes on in the same direction, to the lower part of the Chin, where it is inserted tendinous and fleshy, into a slight depression on the under, and a little on the posterior part of the Lower Jaw, almost contiguous to its fellow. Besides the attachment of the middle tendon to the Os Hyoides, there is a ligamentous binding, which serves, in some measure, as a pulley. This is more marked in some subjects than in others; and this depends on the strength of the tendinous expansion, which binds the tendon of the Digastricus to the Os Hyoides.

When

When we say that these parts are attached to the Os Hyoides, we do not mean that they can be traced quite into it, like some other tendons in the body; but the Os Hyoides seems to be the most fixed point of attachment. Very often we find two anterior bellies to each Muscle; the uncommon one, which is the smallest, does not pass to the Chin, but joins with a similar portion of the other side, in a middle tendon, which is often fixed to the Os Hyoides. At other times, we find such a portion on one side only; in which case it is commonly fixed to the middle tendon of the Mylo-Hyoidæus.

The use of these Muscles with regard to the Lower-Jaw, is principally to depress it; but according as one acts a little more forcibly than the other, it thereby gives the Jaw a small rotation; and becomes, in that respect, a kind of antagonist to the Pterygoidæus Externus. Besides depressing the Lower Jaw, when we examine the dead body, they would appear to raise the Larynx. But, although they have this effect, a proper attention to what happens in the living body, will probably ſhew, that their principal action is to depress the Lower Jaw, and that they are the Muscles which are commonly employed for this purpose. Let a finger be placed on the upper part of the Sterno-Mastoidæus Muscle, just behind the posterior edge of

the Mastoid Process, about its middle, touching that edge a little with the finger; then depress the Lower Jaw, and the posterior head of the Digastric will be felt to swell very considerably, and so as to point out the direction of the Muscle. In this there can be no deception; for there is no other Muscle in this part that has the same direction; and those who are of opinion that the Digastric does not depress the Lower Jaw, will more readily allow this, when they are told, that we find the same head of the Muscle act in deglutition, but not with a force equal to that which it exerts in depressing the Lower Jaw. Further, if the Sterno-Hyoidæi, Sterno-Thyroidæi, and Costo-Hyoidæi, acting at the same time with the Mylo-Hyoidæi, and Genio-Hyoidæi, assisted in depressing the Jaw, the Os Hyoides, and Thyroide Cartilage, would probably be depressed, as the bellies of the Sterno-Hyoidæi, and of the other lower muscles, are by much the longest; but, on the contrary, we find that the Os Hyoides, with the Thyroide Cartilage, is a little raised in the depression of the Jaw, which we may suppose to be done by the anterior belly of the Digastric: and secondly, if these Muscles were to act to bring about this motion of the Jaw, these parts would be brought forwards, nearer to the straight line between the Chin and Sternum, which is not the case in this action; whereas we find it to be the case in deglutition, in which these evidently act. By applying

ing our fingers upon the Genio-Hyoidæus, and Mylo-Hyoidæus, near the Os Hyoides, between the two anterior bellies of the Digastric (not near the Chin, where the action of these two bellies may occasion a mistake), we find these Muscles quite flaccid; which is not the case in deglutition, nor in speaking, in which they certainly do act; nor do we find the Muscles under the Os Hyoides at all affected, as they are in the motion of the Larynx.

It has been observed, that when we open the mouth, while we keep the Lower Jaw fixed, the fore part of the Head or Face is necessarily raised. Authors have been at a good deal of pains to explain this. Some of them considered the Condyles of the Jaw as the centre of motion; but if this were the case, that part of the Head, where it articulates with the Spine, and of consequence the whole body, must be depressed, in proportion as the Upper Jaw is raised; which is not true in fact. Others have considered the Condyles of the Occiput as the centre of motion; and they have conceived the Extensor Muscles of the Head to be the moving powers. The Muscles which move the Head in this case, are pointed out by two circumstances, which attend all muscular motion: in the first place, all actions of our body have Muscles immediately adapted to them; and secondly, when the mind wills any particular action, its power is applied by instinct

to those Muscles only, which are naturally adapted to that motion; and further, the mind being accustomed to see the part move which is naturally the most moveable, attends to its motion in the volition, although it be in that instance fixed, and the other parts of the body move towards it; and although the other parts of the body might be brought towards it by other Muscles, and would be so, if the mind intended that they should come towards it, yet these Muscles are not brought into action. Thus the Flexors of the Arm commonly move the hand to the body; but if the hand be fixed, the body is moved by the same Muscles to the hand. In this case, however, the mind wills the motion of the hand towards the body, and brings the Flexors into action; whereas, if it wished to bring the body towards the hand, the Muscles of the fore part of the body would be put into action, and this would produce the same effect.

To apply this to the Lower Jaw; when we attempt to open the Mouth, while the Lower Jaw is immoveable, we fix our attention upon the very same Muscles (whatever they are) which we call into action, when we depress the Lower Jaw; and we find that we act with the very same Muscles; for our mind attends to the depressing of the Jaw, and not the raising of the face; and under such circumstances the mouth is

actually

actually opened. We find then by these means the head is raised; and the idea that we have of this motion, is the same that we have in the common depression of the Jaw; and we should not know, except from circumstances, that the Jaw was not really depressed; and we find at this time too, that the Extensors of the head are not in action. On the contrary, when the Jaw is fixed in the same situation, if we have a mind to raise the head, or Upper Jaw, which of course must open the mouth, we fix our attention to the Muscles that move the head backwards, without having the idea of opening our mouth; and at this time the Extensors of the head act. This plainly shows, that the same Muscles which depress the Jaw, when moveable, must raise the head when the Jaw is kept fixed.

This is a proof, too, that there are no other Muscles employed in depressing the Lower Jaw, than what will raise the head under the circumstances mentioned. This will further appear from the structure of the parts, wherein four things are to be considered, viz. the articulation of the Jaw; the articulation of the Head with the Neck; the origin, and the insertion of Digastric Muscle.

* Suppose A, the Upper Jaw, to be fixed, and the Lower Jaw B, to be moveable on the Condyle C: if the Digastric

* Vide Plate II.

Digraſtic contracts, its origin E, and insertion F, will approach towards one another; in which case it is evident, that the Lower Jaw will move downwards and backwards. But if the Lower Jaw be fixed, as in the case supposed, and the Vertebræ GGG be also fixed, the Condyle will move upwards and forwards upon the eminence in the joint, the fore part of the head will be pushed upwards and backwards by the Condyle, and the hind part of the head will be drawn down; so that the whole shall make a kind of circular motion upon the upper Vertebræ; and the Digaſtric Muscle pulling the hind part of the head towards the Lower Jaw, and at the same time pushing up the Condyles against the fore part of the head, acquires, by this mechanism, a very considerable additional power.

OF THE

STRUCTURE OF A TOOTH.

And, First, of the ENAMEL.

A TOOTH is composed of two substances, viz. Enamel and Bone. The Enamel, called likewise the vitreous or cortical part, is found only upon the body of the Tooth, and is there laid all around, on the outside of the bony or internal substance *. It is by far the hardest part of our body; insomuch that the hardest and sharpest saw will scarcely make an impression upon it, and we are obliged to use a file in dividing or cutting it. When it is broken, it appears fibrous or striated; and all the fibres or striæ are directed from the circumference to the centre of the Tooth †.

This, in some measure, both prevents it from breaking in mastication, as the fibres are disposed in arches, and keeps the Tooth from wearing down, as the ends of the fibres are always acting on the food.

The

* Vide Plate XIV. Fig. 14, 15, and 17.

† Vide Plate XIV. Fig. 21, 22, and 23.

The Enamel is thickest on the grinding surface, and on the cutting edges, or points, of the Teeth; and becomes gradually thinner on the sides, as it approaches the neck, where it terminates insensibly, though not equally low, on all sides of the Teeth *. On the base or grinding surface it is of a pretty equal thickness, and therefore is of the same form with the bony substance which it covers †.

It would seem to be an earth united with a portion of animal substance, as it is not reducible to quick lime by fire, till it has first been dissolved in an acid. When a Tooth is put into a weak acid, the Enamel, to appearance, is not hurt; but on touching it with the fingers, it crumbles down into a white pulp. The Enamel of Teeth, exposed to any degree of heat, does not turn to lime: it contains animal mucilaginous matter; for, when exposed to the fire, it becomes very brittle, cracks, grows black, and separates from the inclosed bony part of the Tooth. It is capable, however, of bearing a greater degree of heat than the bony part, without becoming brittle and black ‡. This substance has no marks of being vascular

* Vide Plate XIV. Fig. 21, 22, and 23.

† Vide ditto.

‡ From this circumstance we can shew the Enamel better by burning a Tooth, as the bony part becomes black sooner than the Enamel. The Method of burning and shewing them after they are burnt, is as follows.—Let one half of a Tooth be filed

cular, and of having a circulation of fluids: the most subtile injections we can make never reach it; it takes no tinge from feeding with madder, even in the youngest animals; and as was observed above, when soaked in a gentle acid, there appears no *gristly* or *fleshy* part, with which the earthy part had been incorporated *.

We shall speak of the use and formation of the Enamel hereafter, when they will be better understood.

filed away, from one end to the other; then burn it gently in the fire: after this is done, wash the filed surface with an acid, or scrape it with a knife. By this method you will clean the edge of the Enamel, which will remain white, and the bony part will be found black.

* In all these experiments I never could observe, that the Enamel was in the least tinged, either in the growing or formed Tooth. This looks as if the Enamel were the earth more fully depurated, or strained off from the common juices, in such a manner as not to allow the gross particles of madder to pass. Here it may not be amiss to remark, that the names given to animal substance, such as Gluten, &c. are not in the least expressive of the thing meant; for there is no such thing as glue in an animal, till it has either undergone a putrefactive process, or been changed by heat. And here, too, I would be understood, that I call earth no part of an animal; nor does it make up any part of an animal substance.

OF THE BONY PART OF A TOOTH.

THE other substance of which a Tooth is composed, is bony; but much harder than the most compact part of bones in general. This substance makes the interior part of the body, the neck, and the whole of the root of a Tooth. It is a mixture of two substances, viz. calcareous earth and an animal substance, which we might suppose to be organized and vascular. The earth is in very considerable quantity; it remains of the same shape after calcination, so that it is in some measure kept together by cohesion; and it is capable of being extracted by steeping in the muriatic, and some other acids. The animal substance, when deprived of the earthy part, by steeping in an acid, is more compact than the same substance in other bones, but still is soft and flexible.

That part of a Tooth which is bony, is nearly of the same form as a complete Tooth; and thence, when the Enamel is removed, it has the same sort of edge, point, or points, as when the Enamel remained. We cannot by injection prove that the bony part of a Tooth is vascular:

vascular: but from some circumstances it would appear that it is so; for the fangs of Teeth are liable to swellings, seemingly of the spina ventosa kind, like other bones; and they sometimes anchylose with the socket, by bony and inflexible continuity, as all other contiguous bones are apt to do. But there may be a deception here; for the swelling may be an original formation, and the anchylosis may be from the pulp that the Tooth is formed upon being united with the socket. The following considerations would seem to shew that the Teeth are not vascular:—First, I never saw them injected in any preparation, nor could I ever succeed in any attempt to inject them, either in young or old subjects; and therefore believe that there must have been some fallacy in the cases where they have been said to be injected—secondly, we are not able to trace any vessels going from the pulp into the substance of the new formed Tooth; and whatever part of a Tooth is formed, it is always completely formed; which is not the case with other bones. But what is a more convincing proof, is reasoning from the analogy between them and other bones, when the animal has been fed with madder. Take a young animal, viz. a pig, and feed it with madder for three or four weeks; then kill the animal, and, upon examination, you will find the following appearance: first, if this animal had some parts of its Teeth formed before the feeding with madder, those parts will

be known by their remaining of this natural colour; but such parts of the Teeth as were formed while the animal was taking the madder, will be found to be of a red colour. This shews, that it is only those parts that were forming while the animal was taking the madder, that are dyed; for what were already formed will not be found in the leaſt tinged. This is different in all other bones; for we know that any part of a bone which is already formed, is capable of being dyed with madder, though not so fast as the part that is forming; therefore, as we know that all other bones when formed are vascular, and are thence susceptible of the dye, we may readily suppose that the Teeth are not vascular, because they are not susceptible of it after being once formed. But we shall carry this still farther; if you feed a pig with madder for some time, and then leave it off for a considerable time before you kill the animal, you will find the above appearances still subsisting, with this addition, that all the parts of the Teeth which were formed, after leaving off feeding with the madder, will be white. Here then in some Teeth we shall have white, then red, and then white again; and so we shall have the red and the white colour alternately through the whole Tooth.

This experiment shews, that the Tooth once tinged, does not lose its colour; now, as all other bones that have been once tinged lose their colour in time, when the

the animal leaves off feeding with madder (though very slowly), and as that dye must be taken into the constitution by the absorbents, it would seem that the Teeth are without absorbents, as well as other vessels.

This shews that the growth of the Teeth is very different from that of other bones. Bones begin at a point, and shoot out at their surface; and the part that seems already formed, is not in reality so; for it is forming every day by having new matter thrown into it, till the whole substance is complete; and even then it is constantly changing its matter.

Another circumstance in which Teeth seem different from bone, and a strong circumstance in support of their having no circulation in them, is, that they never change by age, and seem never to undergo any alteration, when completely formed, but by abrasion; they do not grow softer, like the other bones, as we find in some cases, where the whole earthy matter of the bones has been taken into the constitution.

From these experiments it would appear, that the Teeth are to be considered as extraneous bodies, with respect to a circulation through their substance; but they have most certainly a living principle, by which means they make part of the body, and are capable of

uniting

uniting with any part of a living body; as will be explained hereafter: and it is to be observed, that affections of the whole body have less influence upon the Teeth than any other part of the body. Thus, in children affected with the rickets, the Teeth grow equally well as in health, though all the other bones are much affected; and hence their Teeth being of a larger size in proportion to the other parts, their mouths are protuberant.

OF

OF THE
CAVITY OF THE TEETH.

EVERY Tooth has an internal Cavity, which extends nearly the whole length of its bony part.* It opens, or begins at the point of the fang, where it is small; but in its passage becomes larger, and ends in the body of the Tooth†. This end is exactly of the shape of the body of the Tooth to which it belongs. In general it may be said, that the whole of the Cavity is nearly of the shape of the Tooth itself, larger in the body of the Tooth, and thence gradually smaller to the extremity of the fang; simple, where the Tooth has but one root‡; and in the same manner compounded, when the Tooth has two or more fangs §.

This Cavity is not cellular, but smooth in its surface: it contains no marrow, but appears to be filled with blood-

* Vide Plate XIV. Fig. 1, 2, 3, &c.
† Vide Plate XIV. Fig. 1, 2, 3, &c.
‡ Vide Plate XIV. Fig. 3, 4, 5, and 6.
§ Vide Plate XIV. Fig. 1, 2.

blood-vessels*, and, I suppose, nerves, united by a pulpy or cellular substance. The vessels are branches of the superior and inferior Maxillaries; and the nerves must come from the second and third branches of the fifth pair.

By injections we can trace the blood-vessels distinctly through the whole Cavity of the Tooth; but I could never trace the Nerves distinctly even to the beginning of the Cavity.

* Vide Plate XII. Fig. 7, 8.

OF THE

PERIOSTEUM OF THE TEETH.

THE Teeth, as we observed, are covered by an Enamel only at their bodies; but at their fangs they have a Periosteum, which, though very thin, is vascular, and appears to be common to the Tooth which it incloses, and the socket, which it lines as an investing internal membrane. It covers the Tooth a little beyond the bony socket, and is there attached to the Gum.

OF THE

SITUATION OF THE TEETH.

THE general shape and situation of the Teeth are obvious. The opposition of those of the two Jaws, and the circle which each row describes, need not be particularly explained, as they may be very well seen in the living body, and may be supposed to be already understood, from what was said of the Alveolar Processes.

We may just observe, with regard to the situation of the two rows, that when they are in the most natural state of contact, the Teeth of the Upper Jaw project a little beyond the lower Teeth, even at the sides of the Jaws; but still more remarkably at the fore part, where, in most people, the upper Teeth lie before those of the Lower Jaw*: and at the lateral part of each row, the line, or surface of contact, is hollow from behind forwards, in the Lower Jaw; and in the same proportion it is convex in the Upper Jaw†.

The

* Vide Plate III. Fig. 1, 2.
† Vide Plate III. Fig. 1, 2.

The edge of each row is single at the fore part of the Jaws; but as the Teeth grow thicker backwards, it there splits into an internal and external edge. The canine Tooth, which we shall call *Cuspidatus*, is the point from which the two edges go off; so that the first grinder, or what we shall call the first *Bicuspis*, is the first Tooth that has a double edge *.

* Vide Plate IV. Fig. 1, 2.

OF THE NUMBER OF TEETH.

THEIR Number in the whole, at full maturity, is from twenty-eight to thirty-two: I once saw twenty-seven only; never more than thirty-two. Fourteen of them are placed in each Jaw, when the whole number is no more than twenty-eight; and sixteen, when there are thirty-two. If the whole be twenty-nine or thirty-one in number, the Upper Jaw sometimes, and sometimes the Lower, has one more than the other; and when the number is thirty, I find them sometimes divided equally between the two Jaws; and in other subjects sixteen of them are in one Jaw, and fourteen in the other. In speaking of the Number of Teeth, I am supposing that none of them have been pulled out, or otherwise lost; but that there are from eight to twelve of those large posterior Teeth, which I call Grinders, and that they are so closely planted as to make a continuity in the circle: and in this case, when the number is less than thirty-two, the deficiency is in the last grinder.

The Teeth differ very much in figure from one another; but those on the right side in each Jaw resemble exactly

exactly those on the left, so as to be in pairs; and the pairs belonging to the Upper Jaw nearly resemble the corresponding Teeth of the Lower Jaw in situation, figure, and use*.

Each Tooth is divided into two parts, viz. first, the body, or that part of it which is the thickest, and stands bare beyond the Alveoli and Gums; secondly, the fang, or root, which is lodged within the Gum and Alveolar Process: and the boundary between these two parts, which is grasped by the edge of the Gum, is called the Neck of a Tooth. The bodies of the different Teeth differ very much in shape and size, and so do their roots. The difference must be considered hereafter.

The Teeth of each Jaw are commonly divided into three classes, viz. *Incisors*, *Canine*, and *Grinders*; but from considering some circumstances of their form, growth, and use, I choose to divide them into the four following classes, viz. *Incisores*, commonly called Fore Teeth; *Cuspidati*, vulgarly called *Canine*; *Bicuspides*, or the two first Grinders; and *Molares*, or the three last Teeth. The number of each class, in each Jaw, for the most part, is four *Incisores*, two *Cuspidati*, four *Bicuspides*, and four, five, or six *Molares*.

There

* Vide Plate III. IV. V.

There is a regular gradation, both in growth and form, through these classes, from the *Incisores* to the *Molares*, in which respect the *Cuspidati* are of a middle nature, between the *Incisores* and *Bicuspides*, as the last are between the *Cuspidati* and *Molares*; and thence the *Incisores* and *Molares* are the most unlike in every circumstance*†.

OF

* Vide Plate III. and V.

† It is here to be understood, that the Teeth from which we take our description, are such as are just completely formed, and therefore not in the least worn down by mastication. Our description of each class is taken from the Lower Jaw; and the difference between them and their corresponding classes in the Upper, immediately follows that description.

OF THE

INCISORES.

THE *Incisores* are situated in the anterior part of the Jaw; the others more backwards on each side, in the order in which we have named them. The bodies of the *Incisores* are broad, having two flat surfaces, one anterior, the other posterior. These surfaces meet in a sharp cutting edge. The anterior surface is convex in every direction, and placed almost perpendicularly; and the posterior is concave and sloping, so that the cutting edge is almost directly over the anterior surface *.

These surfaces are broadest and the Tooth is thinnest at the cutting edge, or end of the Tooth, and thence they become gradually narrower and the tooth thicker towards the neck, where the surfaces are continued to the narrowest side, or edge of the fang. The body of an *Incisor*, in a side-view, grows gradually thicker, or broader, from the edge or end of the Tooth to its neck; and these coincide with the flat or broad side of the fang; so that when we look on the fore part, or on the back

* Vide Plate XIV. and Plate V. row 3, 4.

back part of an *Incisor*, we observe it grows constantly narrower from its cutting edge to the extremity of its fang. But in a side-view it is thickest or broadest at its neck, and thence becomes gradually more narrow, both to its cutting edge, and to the point of its fang *.

The Enamel is continued farther down, and is thicker on the anterior and back part of the *Incisores* than on their sides, and is even a little thicker on the fore part than upon the back part of the Tooth. If we view them laterally, either when entire, or when cut down through the middle, but especially in the latter case, it would seem as if the fang was driven like a wedge into, and had split the body or Enamel of the Tooth †. They stand almost perpendicularly, their bodies being turned a little forwards. Their fangs are much shorter than those of the *Cuspidati*, but pretty much of the same length with all the other Teeth of this Jaw ‡.

In the Upper Jaw they are broader and thicker, especially the two first: their length is nearly the same with those of the Lower Jaw. They stand a little obliquely, with their bodies turned much more forwards (the first especially), and they generally fall over those of the Under Jaw.

The

* Vide Plate V.
† Vide Plate XIV. Fig. 17.
‡ Vide Plate III. Fig. 2.

The two first *Incisores* cover the two first, and half of the second of the Lower Jaw; so that the second *Incisor* in the Upper Jaw covers more than half of the second, and more than the half of the *Cuspidatus* of the Under Jaw *.

The edges of the *Incisores*, by use and friction, in some people, become blunt and thicker; and in others they sharpen one another, and become thinner.

* Vide Plate III. Fig 1.

OF THE

CUSPIDATUS.

THE *Cuspidatus* is the next after the *Incisores* in each Jaw; so that there are four of them in all. They are in general thicker than the *Incisores*, and considerably the longest of all the Teeth*.

The shape of the body of the *Cuspidatus* may be very well conceived, by supposing an *Incisor*, with its corners rubbed off, so as to end in a narrow point, instead of a thin edge †; and the fang differs from that of an *Incisor*, only in being much larger ‡.

The outside of the body of a *Cuspidatus* projects most at the side next the *Incisores*, being there more angular than any where else.

The

* Vide Plate VI. Fig. 1. Plate V. Row I, 3d Fig. *bb*.

† Vide Plate IV. Fig. 1, at *bb*.

‡ Vide Plate VI. Fig. 1.

The Enamel covers more of the lateral parts of these Teeth than of the *Incisores*; they stand perpendicularly, or nearly so, projecting farther out in the circle than the others; so that the two *Cuspidati* and the four *Incisores* often stand almost in a straight line, especially in the Lower Jaw.

This takes place only in adults, and in them only when the second Teeth are rather too large for the arch of the Jaw; for we never find this when the Teeth are at any distance from one another, or in young subjects. Their points commonly project beyond the horizontal line formed by the row of Teeth; and their fangs run deeper into the Jaws, and are oftener a little bent.

In the Upper Jaw they are rather longer, and do not project much beyond the circle of the adjacent Teeth; and in this Jaw they are not placed vertically, their bodies being turned a little forwards and outwards.

When the Jaws are closed, the *Cuspidatus* of the Upper Jaw falls between, and projects a little over the *Cuspidatus* and first *Bicuspis* of the Lower Jaw. When they are a little worn down by use, they commonly first take an edge somewhat like a worn *Incisor*, and afterwards become rounder.

The use of the *Cuspidati* would seem to be, to lay hold of substances, perhaps even living animals; they are not formed for dividing, as the *Incisores* are; nor are they fit for grinding. We may trace in these Teeth a similarity in shape, situation, and use, from the most imperfectly carnivorous animal, which we believe to be the human species, to the most perfectly carnivorous, viz. the lion.

OF THE
BICUSPIDES.

IMMEDIATELY behind the *Cuspidati*, in each Jaw, stand two Teeth, commonly called the first and second Grinders; but which, for reasons hinted at above, I shall suppose to constitute a particular class, and call them *Bicuspides*.

These (viz. the fourth and fifth Tooth from the symphysis of the Jaw) resemble each other so nearly, that a description of the first will serve for both. The first indeed is frequently the smallest, and has rather the longest fang, having somewhat more of the shape of the *Cuspidatus* than the second.

The body of this Tooth is flattened laterally, answering to the flat side of the fang. It terminates in two points, viz. one external and one internal. The external is the longest and thickest; so that on looking into the mouth from without, this point only can be seen, and the Tooth has very much the appearance of a *Cuspidatus*; especially the first of these Teeth. The internal

point

point is the least, and indeed sometimes so very small, that the Tooth has the greatest resemblance to a *Cuspidatus* in any view*. At the union of the points the Tooth is thickest, and thence it loses in thickness, from side to side, to the extremity of the fang; so that the fang continues pretty broad to the point, and is often forked there. All the Teeth hitherto described often have their points bent, and more particularly the *Cuspidati*.

The Enamel passes somewhat farther down externally, and upon the inside, than laterally; but this difference is not so considerable as in the *Incisores*, and *Cuspidati*; in some indeed it terminates equally all round the Tooth. They stand almost perpendicularly, but seem to be a little turned inwards, especially the last of them.

In the Upper Jaw they are rather thicker than in the Lower, and are turned a very little forwards and outwards. The first in the Upper Jaw falls between the two in the Lower. The second falls between the second and the first Grinder: and both project over those of the Lower Jaw, but less than the *Incisores* and *Cuspidati*.

The *Bicuspides*, and especially the second of them, in both Jaws, are oftener naturally wanting than any of the

* Vide Plate IV. Fig. 1, 2, *c*, *c*.

the Teeth, except the *Dentes Sapientiæ :* thence we might conjecture that they are less useful ; and this conjecture appears less improbable, when we consider that, in their use, they are of a middle nature between Cutters and Grinders ; and that in most animals, so far as I have observed, there is a vacant space between the Cutters and Grinders. I have also seen a Jaw in which the first *Bicuspis* was of the same shape and size as a Grinder, and projected, for want of room, between the *Cuspidatus* and second *Bicuspis.* These and the Grinders alter very little in shape on their grinding surfaces by use; their points only wear down, and become obtuse.

OF THE
GRINDERS.

IN describing the Grinders, we shall first consider the first and second conjunctly, because they are nearly the same in every particular; and then give an account of the third or last Grinder, which differs from them in some circumstances.

The two first Grinders differ from the Bicuspides, principally in being much larger, and in having more points upon their body, and more fangs*.

The body forms almost a square, with rounded angles. The grinding surface has commonly five points, or protuberances, two of which are on the inner, and three on the outer part of the Tooth; and generally some smaller points at the roots of these larger protuberances. These protuberances make an irregular cavity in the middle of the Tooth. The three outer points do not stand so near the outer edge of the Tooth, as the inner do on the inside; so that the body of the Tooth swells out more from the points, or is more convex, on the outside. The body towards its neck becomes but very little smaller, and there divides into two flat fangs, one forwards,

* Vide Plate IV. Fig. 1, 2, *d*, *d*,

forwards, the other backwards, with their edges turned outwards and inwards, and their sides consequently forwards and backwards: the fangs are but very little narrower at their ends, which are pretty broad, and often bifurcated. There are two cavities in each fang, one towards each edge, leading to the general cavity in the body of the Tooth. These two cavities are formed by the meeting of the sides of the fang in the middle, thereby dividing the broad and flat cavity into two*; and all along the outside of these (and all the other flat fangs) there is a corresponding longitudinal groove. These fangs, at their middle, are generally bent a little backwards †.

The Enamel covers the bodies of these Teeth pretty equally all round.

The first Grinder is somewhat larger and stronger than the second; it is turned a little more inwards than the adjacent *Bicuspides*, but not so much as the second Grinder. Both of them have generally shorter fangs than the *Bicuspides*.

There is a greater difference between these Grinders in the Upper and Lower Jaw, than any of the other

* Vide Plate XIV. Fig. 7, where four dark spots are observed.

† Vide Plate VI. Fig. 1.

Teeth. In the Upper Jaw they are rather rhomboidal than square in their body, with one sharp angle turned forwards and outwards, the other backwards and inwards: besides, they have three fangs, which diverge, and terminate each in a point; these are almost round, and have but one cavity. Two of them are placed near each other perpendicularly, over the outside of the Tooth; and the other, which generally is the largest, stands at a greater distance on the inside of the Tooth, slanting inwards. In this Jaw these two Grinders are inclined outwards, and a little forwards; they project a little over the corresponding Teeth of the Lower Jaw, and they are placed farther back in the mouth, so that each is partly opposed to two of the Lower Jaw. The second in the Upper Jaw is smaller than the others, and the first and second are placed directly under the Maxillary Sinus. I once saw the second Grinder naturally wanting on one side of the Lower Jaw.

The third Grinder is commonly called *Dens Sapientiæ*; it is a little shorter and smaller than the others, and inclined a little more inwards and forwards. Its body is nearly of the same figure, but rather rounder, and its fangs are generally not so regular and distinct; for they often appear squeezed together; and sometimes there is only one fang, which makes the Tooth conical: it is much smaller than the rest of the Grinders. In the Upper

Upper Jaw this Tooth has more variety than in the Lower, and is even smaller than the corresponding Tooth of the Lower, and thence stands directly opposed to it; but for this circumstance, the Grinders would reach farther back in the Upper Jaw than in the Lower, which is not commonly the case.

In the Upper Jaw this third Grinder is turned but a very little outwards; is frequently inclined somewhat backwards; and it projects over that of the Under Jaw. It oftener becomes loose than any of the other Teeth.

They are placed under the posterior part of the Maxillary Sinus, and there the parts which compose the Sinus are thicker than in the middle. The variations as to the natural number of the Teeth, depend commonly upon these *Dentes Sapientiæ*.

Thus from the *Incisores* to the first Grinder, the Teeth become gradually thicker at the extremity of their bodies, and smaller from the first Grinder to the *Dens Sapientiæ*. From the *Cuspidatus* to the *Dens Sapientiæ* the fangs become much shorter; the *Incisores* are nearly of the same length with the *Bicuspides*. From the first *Incisor* to the last Grinder, the Teeth stand less out from the sockets and Gums.

The bodies of the Teeth in the Lower Jaw are turned a little outwards at the anterior part of the Jaw, and thence, to the third Grinder, they are inclined gradually more inwards. The Teeth in the Upper Jaw project over those of the Under, especially at the fore part, which is owing to the greater obliquity of the Teeth in the Upper Jaw; for the circle of the sockets is nearly the same in both Jaws. This oblique situation, however, becomes gradually less, from the *Incisores*, backwards to the last Grinder, which makes them gradually project less in the same proportion.

The Teeth in the Upper Jaw are placed farther back in the circle than the corresponding Teeth of the Lower: this is owing to the two first *Incisores* above being broader than the corresponding *Incisores* below. All the Teeth have only one fang, except the Grinders, each of which has two in the Lower Jaw, and three in the Upper *.

The fangs bear a proportion to the bodies of the Teeth; and the reason is evident, for otherwise they would have been easily broken, or pushed out of their sockets. The force commonly applied to them is oblique, not

* Those Anatomists who allow the Teeth to have more fangs, have been led into a mistake, I suppose, by often observing two canals in one fang; and thence concluded, that such a fang was originally two, and that these were now grown together.

not perpendicular; and they are not so firmly fixed in the Upper Jaw, that is, the Alveolar Process in that is not so strong as in the Under Jaw: it is perhaps on this account, that the Grinders in that Jaw have three fangs.

This particular structure in the Alveolar Process of the Upper Jaw, is perhaps to give more room for the *Antrum Highmorianum*; on this supposition, the fangs must be made accordingly, *i. e.* so that they shall not be pushed into that cavity: now, by their diverging, they inclose as it were the bottom of the *Antrum*, and do not push against its middle, which is the weakest part; and the points of three diverging fangs will make a greater resistance (or not be so easily pushed in) than if they were placed parallel. If there had been only two, as in the Lower Jaw, they must have been placed opposite to the thinnest part of the *Antrum*; and three points placed in any direction but a diverging one, would have had here much the same effect as two; and as the force applied is endeavouring to depress the Tooth, and push it inwards, the innermost fang diverges most, and is supported by the inner wall of the *Antrum*. That all this weakness in the Upper Jaw is for the increase of the *Antrum* is probable, because all the Teeth in the Upper Jaw are a good deal similar to those in the Lower, excepting those that are opposite to the

Maxillary

Maxillary Sinus; and here they differ principally in the fangs, without any other apparent reason; and what confirms this, is, that the *Dentes Sapientiæ* in both Jaws are more alike than the other Grinders; for this reason, as I apprehend, because the *Dens Sapientiæ* in the Upper Jaw does not interfere so much with the Maxillary Sinus.

What makes it still more probable that the two first superior Grinders have three fangs, on account of the Maxillary Sinus, is, that the two Grinders on each side of the Upper Jaw, in the child, have three fangs, and we find them underneath the *Antrum*; but those that succeed them have only one fang, as in the Lower Jaw; but by that time the *Antrum* has passed farther back, or rather the arch of the Jaw has projected, or shot forwards, as it were, from under the *Antra*; so that the Alveolar Processes that were under the *Antrum* at one age, are got before it in another.

That the edge of every fang is turned towards the circumference of the Jaw, in order to counteract the acting power, we shall see when we consider the Motion of the Jaw, and the Use of the Teeth.

OF THE

ARTICULATION OF THE TEETH.

THE fangs of the Teeth are fixed in the Gum and Alveolar Processes, by that species of Articulation called Gomphosis, which, in some measure, resembles a nail driven into a piece of wood*.

They are not, however, firmly united with the Processes, for every Tooth has some degree of motion; and in heads which have been boiled or macerated in water, so as to destroy the Periosteum and adhesion of the Teeth, we find the Teeth so loosely connected with their sockets, that all of them are ready to drop out, except the Grinders, which remain as it were hooked, from the number and shape of their fangs.

* Vide Plate I. for the sockets; and Plate VI. for the Teeth themselves in their sockets.

OF

THE GUMS.

THE Alveolar Processes are covered by a red vascular substance, called the Gums, which has as many perforations as there are Teeth; and the neck of a Tooth is covered by, and fixed to this Gum. Thence there are fleshy partitions between the Teeth, passing between the external and internal Gum, and as it were uniting them; these partitions are higher than the other parts of the Gum, and thence form an arch between every two adjacent Teeth. The thickness of that part of the Gum which projects beyond the sockets is considerable; so that when the Gum is corroded by disease, by boiling, or otherwise, the Teeth appear longer, or less sunk into the Jaw. The Gum adheres very firmly in a healthful state both to the Alveolar Process and to the Teeth, but its extreme border is naturally loose all around the Teeth. The Gum, in substance, has something of a cartilaginous hardness and elasticity, and is very vascular, but seems not to have any great degree of sensibility; for though we often wound it in eating, and in picking our Teeth, yet we do not feel much pain upon these occasions; and both in infants and old people,

where

where there are no Teeth, the Gums bear a very considerable pressure, without pain.

The advantage arising from this degree of insensibility in the Gums, is obvious; for till the child cuts its Teeth, the Gums are to do the business of Teeth, and are therefore formed for this purpose, having a hard ridge running through their whole length. Old people, who have lost their Teeth, have not this ridge. When in a sound state, the Gums are not easily irritated by being wounded, and therefore are not so liable to inflammation as other parts, and soon heal.

The Teeth being united to the Jaw by the Periosteum and Gum, have some degree of a yielding motion in the living body. This circumstance renders them more secure; it breaks the jar of bony contact, and prevents fractures both of the sockets and of the Teeth themselves.

OF THE

ACTION OF THE TEETH, ARISING FROM THE MOTION OF THE LOWER JAW.

THE Lower Jaw may be said to be the only one that has any motion in mastication; for the Upper Jaw can only move with the other parts of the head. That the Upper Jaw and head should be raised in the common act of opening the mouth, or chewing, would seem, at first sight, improbable; and from an attentive view of the mechanism of the joints and muscles of those parts, from experiment and observation, we find that they do not sensibly move. We shall only mention one experiment in proof of this, which seems conclusive: let a man place himself near some fixed point, and look over it, to another distant and immoveable object, when he is eating. If his head should rise in the least degree, he would see more of the distant object over the nearest fixed point, which in fact he does not. The nearer the fixed point is, and the more distant the object, the experiment will be more accurate and convincing. The result of the experiment will be the same, if the nearest point has the same motion with the head; as, when he looks from under the edge of a hat, or any thing else put

upon

upon his head, at some distant fixed object. We may conclude then that the motion is entirely in the Lower Jaw: and, as we have already described both the articulation and the motion of the bone, we shall now explain the action of mastication, and, at the same time, consider the use of each class of Teeth.

With regard to the action of the Teeth of both Jaws, in mastication, we may observe once for all, that their action and re-action must be always equal, and that the Teeth of the Upper and Lower Jaws are complete, and equal antagonists both in cutting and grinding.

When the Lower Jaw is depressed, the Condyles slide forwards on the eminences; and they return back again into the cavities, when the Jaw is completely raised.

This simple action produces a grinding motion of the Lower Jaw, backwards on the Upper, and is used when we divide any thing with our fore Teeth, or *Incisores*. For this purpose, the *Incisores* are well formed; as they are higher than the others, their edges must come in contract sooner; and as the Upper project over the Under, we find, in dividing any substance with them, that we first bring them opposite to one another, and as they pass through the part to be divided, the Lower Jaw is brought back, while the Incisors of that Jaw

slide up behind those of the Upper Jaw, and of course pass by one another. In this way they complete the division like a pair of scissars; and at the same time they sharpen one another. There are exceptions to this; for these Teeth in some people meet equally, viz. in those people whose Fore Teeth do not project further from the Gum, or socket, than the back Teeth; and such Teeth are not so fit for dividing: and in some people the Teeth of the Lower Jaw are so placed, as to come before those of the Upper Jaw; this situation is as favourable for cutting as when the over-lapping of the Teeth is the reverse, except for this circumstance, that the Lower Jaw must be longer, and therefore its action weaker.

The other motion of the Lower Jaw, viz. when the lateral Teeth are used, is somewhat different from the former. In opening the mouth, one Condyle slides a little forwards, and the other slides a little further back into its cavity; this throws the Jaw a little to that side, just enough to bring the lower Teeth directly under their corresponding Teeth in the Upper Jaw: this is done, either in dividing, or holding of substances; and these are the Teeth that are generally used in the last-mentioned action. When the true grinding motion is to be performed, a greater degree of this last motion takes place; that is, the Condyle of the opposite side is brought farther forwards, and the Condyle

of

of the same side is drawn farther back into the cavity of the Temporal Bone, and the Jaw is a little depressed. This is only preparatory for the effect to be produced; for the moving back of the first-mentioned Condyle into the socket, is what produces the effect in mastication.

The lateral Teeth in both Jaws are adapted to this oblique motion; in the Lower they are turned a little inwards, that they may act more in the direction of their axis; and here the Alveolar Process is strongest upon the outside, being there supported by the ridge at the root of the Coronoid Process. In the Upper Jaw the obliquity of the Teeth is the reverse, that is, they are turned outwards, for the same reason; and the longest fang of the Grinders is upon the inside, where the socket is strengthened by the bony partition between the *antrum* and nose. Hence it is, that the Teeth of the Lower Jaw have their outer edges worn down first; and *vice versâ*, in the Upper Jaw.

GENE-

GENERAL COMPARISONS

BETWEEN THE

MOTION of the JAW in Young and in Old People.

In children who have not yet Teeth, there does not seem to be a sliding motion in the Lower Jaw. The articular eminence of the Temporal Bone is not yet formed, and the cavity is not larger than the Condyle; therefore the centre of motion in such, must be in the Condyle. In old people, who have lost their Teeth, the centre of motion appears to be in the Condyles, and the motion of their Jaw to be only depression and elevation. They never depress the Jaw sufficiently to bring the Condyle forwards on the eminence, because in them the mouth is sufficiently opened when the Jaw is in its natural position.

Hence it is, that in old people the gums of the two Jaws do not meet in the fore part of the mouth *, and they cannot bite at that part so well, as at the side of the Jaw; and, instead of the grinding motion, which would

* Vide Plate VII. where the Symphysis of the Lower Jaw, when the mouth is shut, projects considerably farther forwards than that of the Upper.

would be useless, where there are no Grinders; they bruise their food rather by a simple motion of the Jaw upwards and downwards.

It is from the want of Teeth in both those ages, that the face is shorter in proportion to its breadth. In an old person, after the Teeth are gone, the face is shorter, while the mouth is shut, by almost the whole lengths of the Teeth in both Jaws; that is, about an inch and a half.

From the want of Teeth too, at both those ages, the cavity of the mouth is then smaller; and the tongue seems too large and unmanageable, more especially in old people. In these last we observed also, that the chin projects forwards, in proportion as the mouth is shut; because the basis of the Lower Jaw (which is all that now remains) describes a wider circle than the Alveolar Process in younger people. The Jaws do not project so much forwards in a child, as in an adult; hence the face is flatter, especially at the lower part. In proportion as the last Grinders are produced, the sides of the curve formed by the Jaws become longer, and push forward the fore part, none of the additional part passing backwards. The fore part also continues nearly of the same size, so that the whole Jaw is longer in proportion to its breadth, and projects farther forwards.

OF THE FORMATION OF THE ALVEOLAR PROCESS.

HAVING considered the Alveolar Processes in their adult or perfect state, we shall next examine and trace them from their beginning.

We observe the beginning of the Alveolar Process at a very early period. In a fœtus of three or four months, it is only a longitudinal groove, deeper and narrower forwards, and becoming gradually more shallow and wider backwards: instead of bony partitions dividing that groove into a number of sockets, there are only slight ridges across the bottom and sides, with intermediate depressions, which mark the future *Alveoli**.

In the Lower Jaw the vessels and nerves run along the bottom of this Alveolar cavity, in a slight groove, which afterwards becomes a complete and distinct bony canal.

The

* Vide Plate VIII. Fig 1, 2.

The Alveolar Process grows with the Teeth, and for some time keeps the start of them. The ridges which are to make the partitions shoot from the sides across the canal, at the mouth of the cell, forming hollow arches: this change happens first at the anterior parts of the Jaws*. As each cell becomes deeper, its mouth also grows narrower, and at length is almost, but not quite, closed over the contained Tooth.

The disposition for contracting the mouth of the cell, is chiefly in the outer plate of the bone, which occasions the contracted orifices of the cells to be nearer the inner edge of the Jaw. The reason, perhaps, why the bone shoots over, and almost covers the Tooth, is, that the Gum may be firmly supported before the Teeth have come through.

The *Alveoli*† which belong to the adult Grinders, are formed in another manner: in the Lower Jaw they would seem to be the remains of the root of the Coronoid Process‡; for the cells are formed for those Teeth in the root of that Process: and in proportion as the body of the bone, and the cells already formed, push forwards from

* Vide Plate VIII. Fig. 1, 2, 3, 4, 5, and 6.

† Vide Plate VIII. Fig. 7, which is most remarkable in those of the Grinders; as these Alveoli are not opened for the exit of the Teeth.

‡ Vide Plate X. Fig. 1.

under that Process, the succeeding cells and their Teeth are formed and pushed forward in the same manner.

In the Upper Jaw there are cells formed in the bercles for the young Grinders, which at first are very shallow, and become deeper and deeper as the Teeth grow; and they grow somewhat faster, so as almost to inclose the whole Tooth before it is ready to push its way through that inclosure and Gum *. There is a succession of these, till the whole three Grinders are formed.

* Vide Plate I. Fig. 10.

OF THE

FORMATION OF THE TEETH IN THE FOETUS.

THE depression, or first rudiments of the *Alveoli*, observable in a Fœtus of three or four months, is filled with four or five little pulpy substances, which are not very distinct at this age. About the fifth month both the processes themselves and the pulpy substances become more distinct; the anterior of which are the most complete. About this age, too, the ossifications begin on the edge of the first *Incisores*. The *Cuspidati* are not in the same circular line with the rest, but somewhat on the outside, making a projection there at this age, there not being sufficient room for them.

In the sixth or seventh month, the edges, or tips, of all these five substances are begun to ossify, and the first of them is a little advanced *; and besides these, the pulp of the sixth Tooth has begun to be formed: it is situated in the tubercle of the Upper

* Vide Plate X. Fig. 4, 5, where these ossifications are represented.

Jaw, and under and on the inside of the Coronoid Process in the Lower Jaw: so that at this age, in both Jaws, there are in all twenty Teeth begun to ossify, and the *stamina* of twenty-four. They may be divided into the *Incisores*, *Cuspidati*, and *Molares*; for at this age there are no *Bicuspides*, the two last Teeth in each side of both Jaws having all the characteristics, and answering all the purposes of the true *Molares* in the adult, though, when these first *Molares* fall out, their places are taken by the *Bicuspides*.

The Teeth gradually advance in their ossification; and, about the seventh, eighth, or ninth month after birth, the *Incisores* begin to cut or pass through the Gums; first, generally, in the Lower Jaw. Before this time, the ossifications in the third Grinder, or that which makes the first in the adult, are begun *.

The *Cuspidatus* and *Molares* of the Fœtus are not formed so fast as the *Incisores*; they generally all appear nearly about the same time, viz. about the twentieth, or twenty-fourth month: however, the first Grinder is often more advanced within the socket than the *Cuspidatus*, and most commonly appears before it,

These

* Vide Plate X. Fig. 6, where the first Incisors had cut the Gum, and where the third Grinder in the child, or first in the adult, was begun to ossify.

These twenty are the only Teeth that are of use to the child from the seventh, eighth, or ninth month, till the twelfth or fourteenth year. These are called the Temporary or Milk Teeth, because they are all shed between the years of seven and fourteen, and are supplied by others.

OF

OF THE
CAUSE OF PAIN IN DENTITION.

THESE twenty Teeth, in cutting the Gum, give pain, and produce many other symptoms which often prove fatal to children in Dentition. It has been generally supposed that these symptoms arise from the Tooth's pressing upon the inside of the Gum, and working its way mechanically; but the following observations seem to be nearer the truth.

The Teeth, when they begin to press against the Gum, irritate it, and commonly give pain. The Gums are then affected with heat, swelling, redness, and the other symptoms of inflammation. The Gum is not cut through by simple or mechanical pressure, but the irritation and consequent inflammation produces a thinning, or wasting of the Gum at this part: for it often happens that when an extraneous, or a dead substance, is contained in the body, that it produces a destruction of the part between it, and that part of the skin which is nearest it, and seldom of the other parts excepting those between it and the surface of a cavity opening externally, and that by no means so frequently.

frequently. And in those cases there is an absorption of the solids, or of the part destroyed, not a melting down, or solution of them into Pus. The Teeth are to be looked upon as extraneous bodies, with respect to the Gum, and as such they irritate the inside of that part in the same manner as the Pus of an abscess, an exfoliation of a bone, or any other extraneous body; and therefore produce the same symptoms, excepting only the formation of matter. If, therefore, these symptoms attend the cutting of the Teeth, there can be no doubt of the propriety of opening the way for them; nor is it ever, as far as I have observed, attended with any dangerous consequence.

OF

OF THE FORMATION AND PROGRESS OF THE ADULT TEETH.

HAVING now considered the first formation, and the progress of the Temporary Teeth, we shall next describe the formation of those Teeth which are to serve through life.

In this enquiry, to avoid confusion, I shall confine the description to the Teeth in the Lower Jaw; for the only difference between those in the two Jaws, is in the time of their appearance, and generally it is later in the Upper Jaw. Their formation and appearance proceed not regularly from the first *Incisor* backwards to the *Dens Sapientiæ*, but it begins at two points on each side of both Jaws, viz. at the first *Incisor*, and at the first *Molaris*. The Teeth between these two points make a quicker progress than those behind.

The Pulp of the first adult *Incisor*, and of the first adult *Molaris*, begin to appear in a Fœtus of seven or eight months, and five or six months after birth the ossification

cation begins in them; soon after birth, the Pulp of the second *Incisor* and *Cuspidatus* begin to be formed, and about eight or nine months afterwards they begin to ossify; about the fifth or sixth year the first *Bicuspis* appears; about the sixth or seventh, the second *Bicuspis* and the second *Molaris*; and about the twelfth, the third *Molaris*, or *Dens Sapientiæ*.

The first five may be called the permanent Teeth: they differ from the temporary in having larger fangs. The permanent *Incisores* and *Cuspidati* are much thicker and broader, and the *Molares* are succeeded by *Bicuspides*, which are smaller, and have but one fang.

All these permanent or succeeding Teeth are formed in distinct *Alveoli* of their own; so that they do not fill up the old sockets of the temporary Teeth, but have their new *Alveoli* formed as the old *ones* decay*.

The first *Incisor* is placed on the inside of the root of the corresponding temporary Tooth, and deeper in the Jaw. The second *Incisor* and the *Cuspidatus* begin to be formed on the inside, and somewhat under the temporary second *Incisor* and *Cuspidatus*. These three are all situated much in the same manner, with respect to the

* Vide Plate X. Fig. 1, 2, and 3.

first set; but as they are larger, they are placed somewhat farther back in the circle of the Jaw.

The first *Bicuspis* is placed under, and somewhat farther back than the first temporary Grinder, or fourth Tooth of the child.

The second *Bicuspis* is placed immediately under the second temporary Grinder.

The second *Molaris* is situated in the lengthening tubercle in the Upper Jaw, and directly under the Coronoid Process in the Lower.

The third *Molaris*, or *Dens Sapientiæ*, begins to form immediately under the Coronoid Process.

The first Adult *Molaris* comes to perfection, and cuts the Gum about the twelfth year of age; the second, about the eighteenth; and the third, or *Dens Sapientiæ*, from the twentieth to the thirtieth: so that the *Incisores* and *Cuspidati* require about six or seven years, from their first appearance, to come to perfection; the *Bicuspides*, about seven or eight; and the *Molares*, about twelve.

It sometimes happens that a third set of Teeth appears in very old people: when this does happen, it is in

in a very irregular manner; sometimes only one, at other times more, and now and then a complete set comes in both Jaws. I never saw an instance of this kind but once, and there two fore Teeth shot up in the Lower Jaw.

I should suppose that a new Alveolar Process must be also formed in such cases, in the same manner as in the production of the first and second sets of Teeth. From what I can learn, the age at which this happens is generally about seventy. From this circumstance, and another that sometimes happens to women at this age, it would appear that there is some effort in nature to renew the body at that period.

When this set of Teeth, which happens so late in life, is not complete, especially where they come in one Jaw, and not in the other, they are rather hurtful than useful; for in that case we are obliged to pull them out, as they only wound the opposite Gum.

THE MANNER IN WHICH A TOOTH IS FORMED.

THE body of the Tooth is formed first; afterwards the Enamel and Fangs are added to it. All the Teeth are produced from a kind of pulpy substance, which is pretty firm in its texture, transparent, excepting at the surface, where it adheres to the Jaw, and has at first the shape of the bodies of the Teeth which are to be formed from it*. These pulpy substances are very vascular; they adhere only at one part to the Jaw, viz. at the bottom of the cavity which is to form the socket, and at that place their vessels enter; so that they are prominent, and somewhat loose in the bony cavity which lodges them.

They grow nearly as large as the body of the Tooth before the ossification begins, and increase a little for some time after the ossification is begun. They are surrounded by a membrane, which is not connected with them, excepting at their root or surface of adhesion.

This

* Vide Plate XII. Fig. 4, 5, 6,

This membrane adheres by its outer surface all around the bony cavity in the Jaw, and also to the gum where it covers the Alveoli.

When the pulp is very young, as in the Fœtus of six or seven months, this membrane itself is pretty thick and gelatinous*. We can examine it best in a new-born child, and we find it made up of two *lamellæ*, an external and internal: the external is soft and spongy, without any vessels; the other is much firmer, and extremely vascular, its vessels coming from those that are going to the pulp of the Tooth: it makes a kind of Capsula for the pulp and body of the Tooth. While the Tooth is within the gum, there is always a mucilaginous fluid, like the Sinovia in the joints, between this membrane and the pulp of the Tooth.

When the Tooth cuts the gum, this membrane likewise is perforated; after which it begins to waste, and is entirely gone by the time the Tooth is fully formed; for the lower part of the membrane continues to adhere to the neck of the Tooth, which has now risen as high as the edge of the gum.

* Vide Plate XII. Fig. 1, 2.

OF THE OSSIFICATION OF A TOOTH UPON THE PULP.

THE beginning of the ossification upon the pulp is by one point, or more, according to the kind of Tooth. In the *Incisores* it is generally by three points, the middle one being the highest, and the first that begins to ossify. The *Cuspidatus* begins by one point only; the *Bicuspis* by two, one external, which is the first and the highest, and the other internal. The *Molares*, either in a child, or an adult, begin by four or five ossifications, one on each point, the external always the first*. Where the Teeth began to ossify at one point only, that ossification gradually advances till the Tooth is entirely completed†; but if there are more than one point of ossification, each ossification increases till their basis come in contact with one another, and there all unite into one‡; after which they advance in growth as one ossification.

The

* Vide Plate X. Fig. 4, where some of the distinct ossifications may be observed.

† Vide Plate XIII. Fig. 1, 2, 3, &c.

‡ Vide Plate X. Fig. 5.

The ossifications in their progress become thicker and thicker where they first began, but increase faster on the edges of the Teeth; so as thence to become more and more hollow, and the cavity becomes deeper*. As the ossification advances, it gradually surrounds the Pulp till the whole is covered by bone, excepting the under surface: and while the ossifications advance, that part of the Pulp which is covered by bone is always more vascular than the part which is not yet covered†.

The adhesion of the Pulp to the new-formed Tooth, or bone, is very slight; for it can always be separated from it without any apparent violence, nor are there any vessels going from the one to the other: the place, however, where it is most strongly attached, is round the edge of the bony part, which is the last part formed. When the bone has covered all the Pulp, it begins to contract a little, and becomes somewhat rounded, making that part of the Tooth which is called the neck; and from this place the fangs begin ‡. When the fangs form, they push up the bodies of the Teeth through the sockets, which waste, and afterwards through the Gum, which also

* Vide Plate XIII. Fig. *a*, *b*, *c*, *d*, two rows of Incisors sawed down the middle, the highest of the child, the other of the adult; *e*, *f*, *g*, two rows of Grinders shewing the same circumstances.

† Vide Plate XII. Fig. 5, 6.

‡ Vide Plate XIII. Fig. 1, 2, 3, &c.

also wastes, as has been explained upon the cutting of the Teeth; for before this time the rising of the Teeth is scarcely observable, as the Pulp was at first nearly of the size of the body of the Tooth itself, and wasted nearly in proportion to the increase of the whole ossification.

The Pulp has originally no process answering to the fang*; but as the cavity in the body of the Tooth is filled up by the ossification, the pulp is lengthened into a fang. The fang grows in length, and rises higher and higher in the socket, till the whole body of the Tooth is pushed out. The socket, at the same time, contracts at its bottom, and grasps the neck, or beginning fang, adheres to it, and rises with it, which contraction is continued through the whole length of the socket as the fang rises; or the socket which contained the body of the Tooth, being too large for the fang, is wasted or absorbed into the constitution, and a new Alveolar portion is raised with the fang; whence in reality the fang does not sink, or descend into the Jaw. Both in the body, and in the fang of a growing Tooth, the extreme edge of the ossification is so thin, transparent, and flexible, that it would appear rather to be horny than bony, very much like the mouth or edge of the shell of a snail when it is growing: and indeed it would seem

* Vide Plate XII. Fig. 1, 4, 5, and 6.

seem to grow much in the same manner *, and the ossified part of a Tooth would seem to have much the same connexion with the pulp as a snail has with its shell.

As the Tooth grows, its cavity becomes gradually smaller, especially towards the point of the fang. In tracing the formation of the fang of a Tooth, we hitherto have been supposing it to be single; but where there are two, or more, it is somewhat different, and more complicated.

When the body of a Molares is formed, there is but one general cavity in the body of the Tooth, from the brim of which the ossification is to shoot, so as to form two or three fangs †. If two only, then the opposite parts of the brim of the cavity of the Tooth shoot across where the Pulp adheres to the Jaw, meet in the middle, and thereby divide the mouth of the cavity into two openings ‡; and from the edges of these two openings the two fangs grow §.

We often find that a distinct ossification begins in the middle of the general cavity upon the root of the

* Vide Plate XIII. Fig. 1, 2, 3, or Fig.

† Vide Plate XIII. Fig. 1, *a a*.

‡ Vide Plate XIII. Fig *b*.

§ Vide Plate XIII. Fig. *c d e*.

Pulp, and two processes coming from the opposite edges of the bony shell join it; which answers the same purpose.

When there are three fangs, we see three processes coming from so many points of the brim of the cavity, which meet in the centre, and divide the whole into three openings*; and from these are formed the three fangs †. We often find the fangs forked at their points, especially in the *Bicuspides*. In this case, the sides of the fang as it grows, come close together in the middle, making a longitudinal groove on the outside; and this union of the opposite sides divides the mouth of the growing fang into two orifices, from which the two points are formed.

By the observations which I have made in unravelling the texture of the Teeth, when softened by an acid, and from observing the disposition of the red parts in the Tooth of growing animals interruptedly fed with madder, I find that the bony part of a Tooth is formed of *Lamellæ*, placed one within another. The outer *Lamella* is the first formed, and is the shortest: the more internal *Lamellæ* lengthen gradually towards the fang; by which means, in proportion as the Tooth grows

* Vide Plate XIII. Fig. *f*, *g*.

† Vide XIII. Fig. *h*, *i*, *k*.

grows longer, its cavity grows smaller, and its sides grow thicker*.

How the earthy and animal substance of the Tooth is deposited on the surface of the Pulp, is not perhaps to be explained.

* Vide Plate XII. Fig 7, 8.

OF THE
FORMATION OF THE ENAMEL.

IN speaking of the Enamel, we postponed treating of its Formation till it could be more clearly understood; and now we shall previously describe some parts which we apprehend to be subservient to its formation, much in the same manner as the Pulp is to the body of the Tooth.

From its situation, and from the manner in which the Teeth grow, one would imagine that the Enamel is first formed; but the bony part begins first, and very soon after the Enamel is formed upon it. There is another pulpy substance opposite to that which we have described: it adheres to the inside of the Capsula, where the Gum is joined to it, and its opposite surface lies in contact with the basis of the above-described Pulp, and afterwards with the new-formed basis of the Tooth: whatever eminences or cavities the one has, the other has the same, but reversed; so that they are moulded exactly to each other.

In

In the *Incisores* it lies in contact not with the sharper cutting edge of the Pulp, or Tooth, but against the hollowed inside of the Tooth; and in the *Molares* it is placed directly against their base, like a Tooth of the opposite Jaw. It is thinner than the other Pulp, and decreases in proportion as the Teeth advance. It does not seem to be very vascular. The best time for examining it, is in a Fœtus of seven or eight months old.

In the granivorous animal, such as the horse, cow, &c. whose Teeth have the Enamel intermixed with the bony part*, and whose Teeth, when forming, have as many interstices as there are continuations of the Enamel, we find processes from the Pulp passing down into those interstices as far as the Pulp which the Tooth is formed from, and there coming into contact with it.

After the points of the first-described Pulp are begun to ossify, a thin covering of enamel is spread over them, which increases in thickness till some time before the Tooth begins to cut the Gum.

The Enamel appears to be secreted from the Pulp above described, and perhaps from the Capsula which incloses the body of the Tooth. That it is from the Pulp and Capsula, seems evident in the horse, ass, ox, sheep,

* Vide Plate XIV. Fig. 19, 20.

sheep, &c. therefore we have little reason to doubt of it in the human species. It is a calcareous earth, probably dissolved in the juices of our body, and thrown out from these parts which act here as a gland. After it is secreted, the earth is attracted by the bony part of the Tooth, which is already formed; and upon that surface it crystallizes.

The operation is similar to the formation of the shell of the egg, the stone in the kidneys and bladder, and the gall-stone. This accounts for the striated crystallized appearance which the Enamel has, when broken, and also for the direction of these *Striæ* *.

The Enamel is thicker at the points and basis than at the neck of the Teeth, which may be easily accounted for from its manner of formation; for, if we suppose it to be always secreting, and laid equally over the whole surface, as the Tooth grows, the first formed will be the thickest; and the neck of the Tooth, which is the last formed part inclosed in this Capsula, must have the thinnest coat; and the fang, where the *Periosteum* adheres, and leaves no vacant space, will have none of the Enamel.

At

* The Author has made many experiments on the formation of different *Calculi*, and finds they are formed by crystallization, which were communicated to his brother, and taught by him to his pupils in 1761, and which he proposes to give to the Public as soon as his time will permit.

At its first formation it is not very hard; for by exposing a very young Tooth to the air, the Enamel cracks and looks rough: but by the time that the Teeth cut the Gum, the Enamel seems to be as hard as ever it is afterwards; so that the air seems to have no effect in hardening it.

OF THE

MANNER OF SHEDDING OF TEETH.

AN opinion has commonly prevailed, that the first set of Teeth are pushed out by the second; this, however, is very far from being the case: and were it so, it would be attended with a very obvious inconvenience; for, were a Tooth pushed out by one underneath, that Tooth must rise in proportion to the growth of the succeeding one, and stand in the same proportion above the rest. But this circumstance never happens: neither can it; for, the succeeding Teeth are formed in new and distinct sockets, and, generally, the *Incisores* and the *Cuspidati* of the second set, are situated on the inside of the corresponding teeth of the first set *; and we find, that in proportion to the growth of the succeeding Teeth, the fangs of the first set decay, till the whole of the fang is so far destroyed, that nothing remains but the neck, or that part of the fang to which the Gum adheres †, and then the least force pushes the Tooth out. It would be very natural to suppose, that this was

* Vide Plate X. Fig. 2, 3.

† Vide Plate XV. which shews the gradual decay in the single and double Teeth, and also in one Grinder of a horse.

was owing to a constant pressure from the rising Teeth against the fangs or sockets of the first set: but it is not so; for, the new Alveoli rise with the new Teeth, and the old Alveoli decay in proportion as the fangs of the old Teeth decay; and when the first set falls out, the succeeding Teeth are so far from having destroyed, by their pressure, the parts against which they might be supposed to push, that they are still inclosed, and covered by a complete bony socket. From this, we see that the change is not produced by a mechanical pressure, but is a particular process in the animal œconomy.

I have seen two or three Jaws where the second temporary Grinders were shedding in the common way, without any Tooth underneath; and in one Jaw, where both the Grinders were shedding, I met with the same circumstance.

A remarkable instance of this sort occurred to me in a lady, who desired me to look at a loose Tooth, which I found was the last temporary Tooth not yet shed. I desired that it might be drawn out, and told her it was of no use, and could not by any art be fixed, as it was one of the Teeth that is naturally shed, and that another might come in its place: however she was disappointed.

These cases prove evidently that, in shedding, the first Teeth are not pushed out by the second set, but that they grow loose, and fall out of their own accord. That the succeeding Teeth have some influence on the shedding of the temporary set, is proved by those very cases; since, in one of the first mentioned, the person was above twenty years of age, and in the other the lady was thirty; and it is reasonable to believe, that the shedding of these Teeth was so late in those instances, from the want of the influence, whatever it is, of the new Teeth. When the *Incisores* and *Cuspidati* of the new set are a little advanced, but long before they appear through their bony sockets, there are small holes leading to them on the inside, or behind the temporary sockets and Teeth; and these holes grow larger and larger, till at last the body of the Tooth passes quite through them.

OF

OF THE

GROWTH OF THE TWO JAWS.

As a knowledge of the manner in which the two Jaws grow will lead to the better understanding the shedding of the Teeth, and as the Jaws seem to differ, in their manner of growing, from other bones, and also vary according to the age, it will be here proper to give some account of their growth.

In a Fœtus three or four months old, we have described the marks of four or five Teeth, which occupy the whole length of the Upper Jaw, and all that part of the Lower which lies before the Coronoid Process, for the fifth Tooth is somewhat under that process*.

These five marks become larger, and the Jaw-bones of course increase in all directions, but more considerably backwards; for in a Fœtus of seven or eight months, the marks of six Teeth in each side of both Jaws are to be observed, and the sixth seems to be in the place where the fifth was; so that in these last four

* Vide Plate VIII. Fig. 1, 2.

months the Jaw has grown in all directions, in proportion to the increased size of the Teeth, and besides has lengthened itself at its posterior end as much as the whole breadth of the socket of that sixth Tooth *.

The Jaw still increases in all points till twelve months after birth, when the bodies of all the six Teeth are pretty well formed; but it never after increases in length between the symphysis and the sixth Tooth; and from this time, too, the Alveolar Process, which makes the anterior part of the arches of both Jaws, never becomes a section of a larger circle, whence the lower part of a child's face is flatter, or not so projecting forwards as in the adult †.

After this time the Jaws lengthen only at their posterior ends; so that the sixth Tooth, which was under the Coronoid Process in the Lower Jaw, and in the tubercles of the Upper Jaw of the Fœtus, is at last, viz. in the eighth or ninth year, placed before these parts; and then the seventh Tooth appears in the place which the sixth occupied, with respect to the Coronoid Process, and tubercle; and about the twelfth or fourteenth year, the eighth

* Vide Plate VIII. Fig. 3, 4, 5, 6, for the general increase of the Jaws, but more particularly backwards.

† Vide Plate VIII. Fig. 7, for these facts.

eighth Tooth is situated where the seventh was placed. At the age of eighteen, or twenty, the eighth Tooth is found before the Coronoid Process in the Lower Jaw, and under, or somewhat before the tubercle in the Upper Jaw, which tubercle is no more than a succession of sockets for the Teeth till they are completely formed.

In a young child, the cavity in the temporal bone for the articulation of the Jaw is nearly in a line with the Gums of the Upper Jaw; and for this reason the Condyle of the Lower Jaw is nearly in the same line*; but afterwards, by the addition of the Alveolar Process and Teeth, the line of the Gums in the Upper Jaw descends considerably below the articular cavity; and for that reason the Condyloid Process is then lengthened in the same proportion.

In old people, who have lost all their Teeth, the articulation comes again into the same line with the Gums of the Upper Jaw†; but in the Lower Jaw, the Condyles cannot be diminished again for accommodating it to the Upper; so that it necessarily projects beyond the Gums of the Upper Jaw, at the fore part.

When

* Vide Plate VIII. Fig. 11.

† Vide Plate VII.

When the mouth is shut, the projection of the Jaw at the chin, fits the two Jaws to each other at that place where the Grinders were situated, and where the strength of mastication lies; but if the chin was not further from the centre of motion than the Gums of the Upper Jaw, at the fore part, the Jaws, in such people as have lost all their Teeth, would meet in a point at the fore part, like a pair of pinchers, and be at a considerable distance behind*.

* Vide Plate VII.

THE

THE

REASON FOR THE SHEDDING OF THE TEETH.

As the shedding of the Teeth is a very singular process in the animal œconomy, many reasons have been assigned for it; but these reasons have not carried along with them that conviction which is desired. Authors have not fully considered the appearances which naturally explain themselves; nor have they considered the advantages necessarily arising from the size and construction of only such a number as the first set; nor have they considered fully the disadvantages that such size and construction would have, if continued when it is necessary to have a greater number, which is the case with the adult.

We shall consider these advantages in a child, where the Shedding-Teeth are completely formed, which will be setting them in the clearest point of light; and also, the disadvantages that would occur, if, in the adult, these were not changed for another set somewhat different.

If

If the child had been so contrived as not to have required Teeth till the time of the second set's appearing, there would have been no occasion for a new set: but the Jaw-bones being considerably smaller in children than in adults, and it being necessary that they should have two Grinders, there is not room for *Incisores* and *Cuspidati* of sufficient size to serve through life; and the first formed Grinders having necessarily too small fangs, and the Jaw increasing at the back part only, these two Grinders would have been protruded too far forwards, and at too great a distance from the center of motion. This variation in the size of the Teeth is likewise a reason why the second set are not formed in the sockets of the first, and why the old sockets are destroyed.

These circumstances, with regard to the shedding of the Teeth, contradict the notion of the second set being made broader and thicker, by the resistance they meet with in pushing out the first. For were we, on a partial view of the subject, to admit the supposition, the *Bicuspides* would effectually overturn our hypothesis; because here the second set are much smaller than the first, and yet the resistance would be greater to them than to the *Incisores*.

From the manner in which the Teeth are shed, it is evident that drawing a temporary Tooth, for the easier protrusion

protrusion of the one underneath, will be of no great service; for in general it falls out before the other can touch it. But it is often of much more service to pull out the neighbouring, or adjacent temporary Tooth; for we must be convinced, by what has been advanced with regard to the changes in size, that, excepting the whole were to shed at the same time, or the order of shedding, viz. from before backwards, were to be inverted, the second set of *Incisores* and *Cuspidati* must be pinched in room, till the Grinders are also shed; and therefore we find it often of use to draw a temporary Tooth, that is placed further back; and it would perhaps be right, upon the whole, always to draw at least the first Grinder; and perhaps some time after, the second Grinder also.

OF THE

CAVITY FILLING UP AS THE TEETH WEAR DOWN.

A TOOTH very often wears down so low, that its cavity would be exposed, if no other alteration were produced in it. To prevent this, Nature has taken care that the bottom part of the cavity should be filled up by new matter, in proportion as the surface of the Teeth is worn down. This new matter may be easily known from the old; for when a Tooth has been worn down almost to the neck, a spot may always be seen in the middle, which is more transparent, and at the same time of a darker colour (occasioned, in some measure, by the dark cavity under it), and is generally softer than the other*. Any person may be convinced of the truth of these observations, by taking two Teeth of the same class, but of very different ages, one just completely formed, the other worn down almost to its neck. In the last, he will observe the dark spot in the centre; and if as much is cut off from the complete Tooth

* Vide Plate XIV. Fig. 24, 25.

Tooth as hath been worn off the old one, the cavity of the young Tooth will be found cut through; and, on examining the other, its cavity will be found filled up below that surface. Now this observation contradicts the idea of the hole, leading into the cavity of the Tooth, being closed up; and what is still a further proof of it, I have been able to inject vessels in the cavities of the Teeth, in very old people, when the Alveolar Process has been gone, and the Teeth very loose in the Gum.

Old people are often found to have very good sets of Teeth, only pretty much worn down. The reason of this is, that such people never had any disorder in their Teeth, or Alveolar Processes, sufficient to occasion the falling of one Tooth. For, if by accident one Tooth is lost, the rest will necessarily fail in some degree, even though they are sound, and likely to remain so, had not this accident happened; and this weakening cause is greater in proportion to the number that are lost. From this observation, we see that the Teeth support one another.

OF THE
CONTINUAL GROWTH OF THE TEETH.

IT has been asserted, that the Teeth are continually growing, and that the abrasion is sufficient to keep them always of the same length; but we find that they grow at once to their full length, and that they gradually wear down afterwards; and that there is not even the appearance of their continuing to grow. The Teeth would probably project a little farther out of the Gum, if they were not opposed by those in the opposite Jaw; for in young people, who had lost a Tooth before the rest had come to their full length, I have seen the opposite Tooth project a little beyond the rest, before they were at all worn down. It may be further observed, that when a Tooth is lost, the opposite one may project, from the disposition of the Alveolar Process to rise higher, and fill up at the bottom of the sockets; and the want of that natural pressure seems to give that diposition to these processes, which is best illustrated in those Teeth which are formed deeper in their sockets than usual. As a proof that the Teeth continue growing, it has been said that the space

of

of a fallen Tooth is almost filled up by the increased thickness of the two adjacent Teeth, and the lengthening of that which is opposite. There is an evident fallacy in the case: either the observations have been made upon such Jaws as above described, or the appearances have not been examined with sufficient accuracy; for when the space appears to have become narrow by the approximation of the two adjacent Teeth, it is not owing to any increase of their breadth, but to their moving from that side where they are well supported, to the other side, where they are not. For this reason, they get an inclined direction; and I observe it extends to the several adjacent Teeth in a proportional less degree, and affects those which are behind *, more than those which are before the vacant space.

In the Lower Jaw the back Teeth are not fixed perpendicularly, but all inclined forward; and the depression of the Jaw increases this position: the action of the Teeth, when thrown out of the perpendicular, has also a tendency to increase that oblique direction, as a pair of scissars, in cutting, pushes every thing forward, or from the centre of motion: therefore this alteration, I think, is most commonly observable in the Lower Jaw.

And

* Vide Plate XVI. Fig 1, *b*, *c*.

And that Teeth are not actually always growing in breadth, must be obvious to every person who considers, that in many people, through life, the Teeth stand so wide from each other, that there are considerable spaces between them; which could not be the case, if they were always growing in thickness.

We might add, too, that, according to the hypothesis, the *Dens Sapientiæ* should grow to an enormous size backward, because there it has no check from pressure; and in people where the *Dens Sapientiæ* is wanting in one Jaw, which is very common, it should grow to an uncommon length in the opposite Jaw for the same reason. But neither of these things happens.

I need hardly take notice, that when a Tooth has lost its opposite, it will in time become really so much longer than the rest, as the others grow shorter by abrasion; and I observe that the Tooth which is opposite to the empty space, becomes in time not only longer for the above-mentioned reason, but more pointed. The apex falls into the void space, and the two sides are rubbed away against the sides of the two approaching Teeth next to that space.

The manner of their formation likewise shews that Teeth cannot grow beyond a certain limited size. To illustrate

illustrate this, I may observe, that I have often, in the dead body of adults, found the left *Cuspidatus* of the Upper Jaw, with its points scarcely protruding out of the Alveolar Process, though the Tooth was completely formed, and longer than the other by the whole point, which in that other was worn away*. This Tooth, at its first formation, had been deeper in the Jaw than what is common; and after it had grown to the ordinary size, it grew no longer, though it had not the resistance of the opposite Teeth to set bounds to its increase: yet commonly, in these cases, the Tooth continues to project further and further through the Gum; though this is not owing to its growing longer, but to the socket filling up behind it, and thereby continuing to push it out by slow degrees.

* Vide Plate VIII. Fig. 8.

OF THE

SENSIBILITY OF TEETH.

THE Teeth would seem to be very sensible; for they appear to be subject to great pain, and are easily and quickly affected by either heat or cold.

We may presume, that the bony substance itself is not capable of conveying sensations to the mind, because it is worn down in mastication, and occasionally worked upon by operators in living bodies, without giving any sensation of pain in the part itself.

In the cavity of a Tooth it is well known that there is exquisite sensibility; and it is likewise believed, that this is owing to the nerve in that cavity. This nerve would seem to be more sensible than nerves are in common, as we do not observe the same violent effects from any other nerve in the body being exposed either by wound or sore, as we do from the exposure of the nerve of a Tooth. Perhaps the reason of the intenseness, as well as the quickness of the sense of heat and cold in the Teeth, may be owing to their communicating these to the nerve sooner than any other part of the body.

OF

SUPERNUMERARY TEETH.

WE often meet with Supernumerary Teeth; and this, as well as some other variations, happens oftener in the Upper than in the Lower Jaw, and, I believe, always in the *Incisores* and *Cuspidati*. I have only met with one instance of this sort, and it was in the Upper Jaw of a child about nine months old: there were the bodies of two Teeth, in shape like the *Cuspidati*, placed directly behind the bodies of the two first permanent *Incisores*; so that there were three Teeth in a row, placed behind one another, viz. the temporary *Incisor*, the body of the permanent *Incisor*, and that supernumerary Tooth. The most remarkable circumstance was, that these Supernumerary Teeth were inverted, their points being turned upwards, and bended by the bone, which was above them, not giving way to their growth, as the Alveolar Process does.

It often happens that the *Incisores* and *Cuspidati*, in the Upper Jaw especially, are so irregularly placed, as to give the appearance of a double row. I once saw a remarkable instance of this in a boy; the second

Incisor in each side was placed farther back than what is common, and the *Cuspidatus* and first *Incisor* closer together, than if the second *Incisor* had been directly between them; so that the appearance gave an idea of a second row of Teeth.

This happens only in the adult set of Teeth, and is owing to there not being room in the Jaw for this second set, the Jaw-bone being formed with the first set of Teeth, and never increasing afterwards; so that if the adult set does not pass further back, they must over-lap each other, and give the appearance of a second row.

OF THE

USE OF THE TEETH, SO FAR AS THEY AFFECT THE VOICE.

THE Teeth serve principally for mastication; and that use need not be farther explained.

They serve likewise a secondary, or subordinate purpose; giving strength and clearness to the sound of the voice, as is evident from the alteration produced in speaking, when the Teeth are lost.

This alteration, however, may not depend entirely upon the Teeth, but, in some measure, on the other organs of the voice having been accustomed to them; and therefore, when they are gone, those other organs may be put out of their common play, and may not be able to adapt themselves so well to this new instrument. Yet I believe that habit, in this case, has no great effect; for those people seldom or never get the better of the defect; and young children, who are shedding their Teeth, and are, perhaps, without any Fore Teeth for half a year or more, always have that defect in their

voice till the new Teeth come; and as these grow, the voice becomes clear again.

This use seems to be entirely in the Fore Teeth; for the loss of one of these makes a great alteration, and the loss of two or three Grinders seems to have no sensible effect. As an argument for the use of the Teeth in modifying the sound of the voice, we may observe, that the Fore Teeth come at a time when the child begins to articulate sounds, and at that time they are so loose in the gums, that they can be of very little service in mastication.

Every defect in speech, arising from this defect in the organ, is generally attended with what we call a lisp. People who have lost all their Teeth, and most old people, for that reason, lose in a great measure their voice. This arises partly from the loss of the Fore Teeth, but principally from the loss of all the Teeth, and of the Alveolar Processes of both Jaws, by which means the mouth becomes too small for the tongue, and the lips and cheeks become flaccid; insomuch, that the nicer movements of these parts, in the articulation of sounds, are obstructed; and thence the words and syllables are indistinctly pronounced, and slurred, or run into one another.

UNDER WHAT CLASS DO THE HUMAN TEETH COME?

NATURAL Historians have been at great pains to prove from the Teeth, that man is not a carnivorous animal; but in this, as in many other things, they have not been accurate in their definitions; nor have they determined what a carnivorous animal is.

If they mean an animal that catches and kills his prey with his Teeth, and eats that flesh of the prey just as it is killed, they are in the right; man is not in this sense a carnivorous animal, and therefore he has not Teeth like those of a Lion; and this, I presume, is what they mean.

But if their meaning were, that the Human Teeth are not fitted for eating meat that has been catched, killed, and dressed by art, in all the various ways that the superiority of the human mind can invent, they are in the wrong. Indeed, from this confined way of thinking, it would be hard to say what the human Teeth are fitted for; because, by the same reasoning, man is not a graminivorous animal, as his Teeth are not fitted for pulling vegetable food, &c. They are not made like those of cows or horses, for example.

The

The light in which we ought to view this subject is, that man is a more perfect or complicated animal than any other; and is not made like others, to come at his food by his Teeth, but by his hands, directed by his superior ingenuity; the Teeth being given only for the purpose of chewing the food, in order to its more easy digestion: and they, as well as his other organs of digestion, are fitted for the conversion of both animal and vegetable substances into blood; and thence he is able to live in a much greater variety of circumstances than any other animal, and has more opportunities of exercising the faculties of his mind. He ought, therefore, to be considered as a compound, fitted equally to live upon flesh and upon vegetables.

OF THE
DISEASES OF THE TEETH.

THE Teeth are subject to diseases as well as other parts of the body. Whatever the disorder is that affects them, it is generally attended with pain; and from this indeed we commonly first know that they are affected.

Pain in the Teeth proceeds, I believe, in a great measure from the air coming into contact with the nerve in the cavity of the Tooth; for we seldom see people affected with the Tooth-ach, but when the cavity is exposed to the air.

It is not easy to say by what means the cavity comes to be exposed.

The most common disease to which the Teeth are subject, begins with a small, dark-coloured speck, generally on the side of the Tooth where it is not exposed to pressure; from what cause this arises is hitherto unknown. The substance of the Tooth thus discoloured, gradually decays, and an opening is made into the cavity. As soon as the air is thereby admitted, a

considerable

considerable degree of pain arises, which is probably owing to the admission of the air, as it may be prevented by filling the cavity with lead, wax, &c. This pain is not always present; the food, and other substances, perhaps fill up the hole occasionally, and prevent the access of the air, and of consequence the pain, during the time they remain in it. When an opening is made into the cavity of the Tooth, the inside begins to decay, the cavity becomes larger, the breath at the same time often acquires a putrid *Fœtor*, the bone continues to decay till it is no longer able to support the pressure of the opposite Tooth; it breaks and lays the cavity open. We have not as yet found any means of preventing this disease, or of curing it; all that can be done, is to fill the hole with lead, which prevents the pain, and retards the decay; but after the Tooth is broken, this is not practicable: and for that reason it is then best to extract it.

It would be best of all to attempt the extraction of a Tooth by drawing it in the direction of its axis: but that not being practicable by the instruments at present in use, which pull laterally, it is the next best to draw a Tooth to that side where the Alveolar Process is weakest; which is the inside, in the two last grinders on each side of the Lower Jaw, and the outside in all the others.

It

It generally happens, in drawing a Tooth, that the Alveolar Process is broken, particularly when the Grinders are extracted; but this is attended with no bad consequences, as that part of the Alveolar Process from which the Tooth was extracted, always decays.

In drawing a Tooth, the patient complains of a disagreeable jarring noise, which always happens when any thing grates against the bones of the head.

OF

CLEANING THE TEETH.

FROM what was said of the nature and use of the Enamel, it is evident, that whatever is capable of destroying it, must be hurtful; therefore all acids, gritty powders, and injudicious methods of scaling the Teeth, are prejudicial: but simply scaling the Teeth, that is, clearing them of the stony concretions which frequently collect about their necks, while nothing is scraped off but that adventitious substance, is proper and useful. If not removed by art, the quantity of the stony matter is apt to increase, and to affect the gum. This matter first begins to form on the Tooth near to the Gum; but not in the very angle, because the motion of the Gum commonly prevents the accumulation of it at this part. I have seen it cover not only the whole Tooth, but a great part of the Gum: in this case there is always an accumulation of a very putrid matter, frequently considerable tenderness and ulcera-

tion

tion of the Gum, and scaling becomes absolutely necessary*.

* The animal fluids, when out of the course of the general circulation, especially when they stagnate in cavities, are apt to deposit an absorbent earth, and form concretions. This earth is sometimes contained in the fluids, and is only deposited, as in the formation of the stone in the urinary passages: in some cases, perhaps, the fluids undergo a change, by which the earth is first formed, and afterwards deposited. This deposition takes place particularly in weakened parts, or where the circulation is languid, or where there are few arteries, such as about joints and tendons; as if it were intended to strengthen these parts, if they should at any time give way; for if an artery, for instance, is overcome by the action of the heart, and unnaturally dilated, its coats have commonly these concretions formed every where in their interstices. The same thing happens also in the coats of incysted tumors, which are constantly distended; in cases of distentions of the Tunica Vaginalis Testis, &c. It is also apt to take place in parts which have lost their natural functions; as in the coats of the eye, in cases of blindness, and in diseased lymphatic glands, &c. and where the living power is diminished in the system, as in the arteries, membranes, &c. of old people; and in some particular habits, as in those who are affected by the gout.

The same sort of deposition takes place likewise where there is any substance with such properties as render it a fit *Basis* for crystallization; as when extraneous bodies are lodged in the bladder: whence such bodies are so often found to form the *Nucleus* of a stone. The same thing happens in the bowels of many animals; whence the *Nucleus* of intestinal concretions, or bezoars, is commonly a nail, or some indigestible substance which had been swallowed. The crust, which collects upon the Teeth, seems to be a crystallization of the same nature.

OF

TRANSPLANTING THE TEETH.

FROM considering the almost constant variety of the size and shape of the same class of Teeth in different people, it would appear almost impossible to find the Tooth of one person that should fit, with any degree of exactness, the socket of another; and this observation is supported, and indeed would seem to be proved, by observing the Teeth in skeletons. Yet we can actually transplant a Tooth from one person to another, without great difficulty, Nature assisting the operation, if it is done in such a way that she can assist; and the only way in which Nature can assist, with respect either to size or shape, is by having the fang of the transplanted Tooth rather smaller than the socket. The socket in this case grows to the Tooth. If the fang is too large, it is impossible indeed to insert it at all in that state; however, if the fang should be originally too large, it may be made less; and this seems to answer the purpose as well.

The success of this operation is founded on a disposition in all living substances to unite when brought into

into contact with one another, although they are of a different ſtructure; and even although the circulation is only carried on in one of them.

This disposition is not so considerable in the more perfect or complex animals, such as quadrupeds, as it is in the more simple or imperfect; nor in old animals, as in young: for the living principle in young animals, and those of simple construction, is not so much confined to, or derived from one part of the body; so that it continues longer in a part separated from their bodies, and even would appear to be generated in it for some time; while a part, separated from an older or more perfect animal, dies sooner, and would appear to have its life entirely dependent on the body from which it was taken.

Taking off the young spur of a cock, and fixing it to his comb, is an old and well-known experiment.

I have also frequently taken out the *Teſtis* of a cock and replaced it in his belly, where it has adhered, and has been nourished; nay, I have put the *Teſtis* of a cock into the belly of a hen with the same effect.

In like manner, a fresh Tooth, when transplanted from one socket to another, becomes to all appearance a part

a part of that body to which it is now attached, as much as it was of the one from which it was taken; while a Tooth which has been extracted for some time, so as to lose the whole of its life, will never become firm or fixed; the sockets will also in this case acquire the disposition to fill up, which they do not in the case of the insertion of a fresh Tooth.

These appearances shew that the living principle exists in the several parts of the body, independent of the influence of the brain, or circulation, and that it subsists by these, or is indebted to them for its continuance; and in proportion as animals have less of brain and circulation, the living power has less dependence on them, and becomes a more active principle in itself; and in many animals there is no brain nor circulation; so that this power is capable of being continued equally by all the parts themselves, such animals being nearly similar in this respect to vegetables.

END OF PART I.

A

PRACTICAL TREATISE

ON THE

DISEASES OF THE TEETH;

INTENDED AS A

SUPPLEMENT, OR SECOND PART,

TO THE PRECEDING

NATURAL HISTORY.

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INTRODUCTION.

THE importance of the Teeth is such, that they deserve our utmost attention, as well with respect to the preservation of them, when in a healthy state, as to the methods of curing them, when diseased. They require this attention, not only for the preservation of themselves, as instruments useful to the body, but also on account of other parts with which they are connected; for diseases in the Teeth are apt to produce diseases in the neighbouring parts, frequently of very serious consequences; as will evidently appear in the following Treatise.

One might, at first, imagine that the diseases of the Teeth must be very simple, and like those which take place every where else in the bony parts of our body; but experience shews the contrary. The Teeth being singular in their structure and some other circum-

stances, have diseases peculiar to themselves. These diseases, considered abstractedly, are indeed very simple; but by the relations which the Teeth bear to the body in general, and to the parts with which they are immediately connected, they become extremely complicated. The diseases which may arise in consequence of those of the Teeth, are various; such as Abscesses, Carious Bones, &c.; many of which, although proceeding originally from the Teeth, are more the object of the Surgeon than of the Dentist, who will find himself as much at a loss in such cases, as if the Abscess or Carious Bone were in the leg, or any other distant part. All the diseases of the Teeth, which are common to them with the other parts of the body, should be put under the management of the Physician or Surgeon; but those which are peculiar to the Teeth, and their connexions, belong properly to the Dentist.

It is not my present purpose to enumerate every disease capable of producing such symptoms as may lead us to suspect the Teeth; for the Jaws may be affected

affected by almost every kind of disorder. I shall therefore confine myself to the diseases of the Teeth, Gums, and Alveolar Processes; which parts having a peculiar connexion, their diseases fall properly within the province of the Dentist. I shall also purposely avoid entering into common Surgery; not to lead the Dentist beyond his depth, and to matters of which it is to be supposed he has not acquired a competent knowledge.

In order that the reader may perfectly understand what follows, it will be necessary for him previously to consider and comprehend the anatomy and uses of every part of a Tooth, as explained in my *Natural History of the Human Teeth*, to which I shall be obliged frequently to refer. Without such previous study, the Dentist will often be at a loss to account for many of the diseases and symptoms mentioned here, and will retain many vulgar errors imbibed by conversing with ignorant people, or by reading books in which the

anatomy and physiology of the Teeth are treated without a sufficient knowledge of the subject.

Whichever of the connected parts be originally diseased, the Teeth are commonly the greatest sufferers. None of those parts can be distempered, without communicating to the Teeth such morbid effects, as tend to the destruction of them.

PART

PART THE SECOND.

CHAP. I.

Of the Diseases of the Teeth, and the Consequences of them.

SECT. I.

THE DECAY OF THE TEETH, ARISING FROM ROTTENNESS.

THE most common disease to which the Teeth are exposed, is such a decay as would appear to deserve the name of mortification. But there is something more; for the simple death of the part would produce but little effect, as we find that Teeth are not subject to putrefaction after death; and therefore I am apt to suspect, that, during life, there is some operation going on which produces a change in the diseased part. It almost always begins externally in a small part of the body of the Tooth, and commonly appears at first as an opaque white spot. This is owing to the Enamel's losing

losing its regular and crystallized texture, and being reduced to a state of powder, from the attraction of cohesion being destroyed; which produces similar effects to those of powdered crystal. When this has crumbled away, the bony part of the Tooth is exposed; and when the disease has attacked this part, it generally appears like a dark brown speck. Sometimes however there is no change of colour, and therefore the disease is not observable till it has made a considerable hole in the Tooth. The dead part is generally at first round, but not always; its particular figure depending more on the place where it begins, than on any other circumstance. It is often observed on the hollow parts of the grinding surface of the *Molares*, and there looks like a crack filled with a very black substance. In the Incisors, the disease usually begins pretty near the neck of the Tooth; and the scooping process goes on enlarging the cavity, commonly across the same part of the Tooth, which almost divides it into two. When such a diseased Tooth give way, the mischief is occasioned by its body breaking off.

When it attacks the bony part, it appears first to destroy the earth, for the bone becomes softer and softer, and is at last so soft on the exterior exposed surface,

face, that it can be picked away with a pin, and when allowed to dry, it cracks like dried clay.

It begins sometimes in the inside of the Tooth, although but rarely. In this case the Tooth becomes of a shining black, from the dark colour being seen through the remaining shell of the Tooth, and no hole is found leading into the cavity.

This blackness is seldom more than a portion of the bony part decayed or mortified. However, it often happens, that the remaining part of the Tooth becomes simply dead; in which state it is capable of taking on a dye. As it is generally on the external surface, one might expect no great mischief would ensue; but the tendency to mortification goes deeper and deeper, till at last it arrives at the cavity of the Tooth, and the mortification follows. Mortification is common to every part of the body: but in most other parts, this tendency is owing in a great measure to the constitution, which being corrected, that disposition ceases; but here it is local, and as such it would appear that we have no power of resisting it. When gone thus far, the decay makes a quicker progress, similar to those cases where the decay begins in the cavity; for then this disposition is given to the whole cavity of the Tooth, which being a much larger surface than what

the

the disease had before to act upon, the increase of the decay seems to be in the same proportion: at last it scoops out its inner substance, till almost nothing is left but a thin shell, which, generally, being broken by mastication, a smaller or larger opening is made, and the whole cavity becomes at length exposed.

The canal in the fang of the Tooth is more slowly affected: the scooping process appears to stop there, for we seldom know a Fang become very hollow to its point, when in the form of a stump; and it sometimes appears sound, even when the body of the Tooth is almost destroyed: hence I conclude, that the Fang of the Tooth has greater living powers than the Body, by which the process of the disease is retarded, and this part appears at last only to lose its living principle, and not to take on the mortifying process above described; for which reason it remains simply a dead Fang: however it does not remain perfectly at rest.

This is the stage in which it is called a Stump. It begins now to lose its sensibility, and is seldom afterwards the cause of pain.

Thus, in appearance, it will remain sometimes for many years, but there will be more or less of a change going on: Nature will be attempting to make

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yet in many cases the part which is already rotten, seems to have some influence upon that which remains; for if the rotten part be perfectly removed before it has arrived at the canal of the Tooth, a stop is sometimes put to the farther progress of the decay, at least for a time.

However this is not constantly so; it is oftener the contrary: but it is expedient in most cases to make this trial, as it is always right to keep a Tooth clean, and free from specks.

This decay of the Teeth does not seem to be so entirely the effect of accident as might be imagined; for it sometimes takes place in them by pairs, in which case we may suppose it owing to an original cause coming into action at its stated time, the corresponding Teeth being in pairs, with respect to the disease, as well as to situation, shape, &c.

This opinion is somewhat strengthened by the fore Teeth in the Lower Jaw not being so subject to decay as those in the Upper, although equally liable to all accidents arising from external influence, which could produce the disease in general.

The Fore Teeth in the Lower Jaw appear to be less subject to this disease than any of the others; the Fore

Teeth

Teeth in the Upper Jaw, and the Grinders in both, are of course more frequently affected.

This disease and its consequences seem to be peculiar to youth and middle age; the shedding Teeth are as subject to it, if not more so, than those intended to last through life: and we seldom or ever see any person, whose Teeth begin to rot after the age of fifty years.

This might be supposed to arise from the disproportion that the number of Teeth, after fifty, bear to them before it; but the number of diseased Teeth after fifty do not bear the same proportion.

This disease has not hitherto been accounted for; if it had been always on the inside of the cavity, it might have been supposed to be owing to a deficiency of nourishment, from some fault in the vascular system; but as it begins most commonly externally, in a part where the Teeth in their most sound state receive little or no nourishment, we cannot refer it to that cause.

It does not arise from any external injury, or from menstrua, which have a power of dissolving part of a Tooth; for any thing of that kind could not act so partially: and we can observe in those Teeth where the

disease has not gone deep, that from the black speck externally there is a gradual decay or alteration leading to the cavity, and becoming fainter and fainter. We may therefore reasonably suppose, that it is a disease arising originally in the Tooth itself; because, when once the shell of the Tooth has given way to the cavity, the cavity itself soon becomes diseased in the same way. That the disease spreads thus rapidly over the cavity, as soon as the Tooth has given way, does not depend simply on the exposure; for if a sound Tooth be broken by accident, so as to expose the cavity. no such quick decay ensues: however, sometimes we find in those cases, that exposure of the cavity will produce a decay, and even pain, similar to an original disease; and in the diseased Tooth we find that the exposure has a considerable effect in hastening the progress of the disease; for if the Tooth be stopped so as to prevent its exposure to external injury, its cavity will not nearly so soon become diseased. Exposure therefore seems at least to assist the decay.

How far a rotten Tooth has the power of contaminating those next to it, I believe, is not yet completely ascertained; some cases seem to favour this idea, and many to contradict it. We frequently see two Teeth rotten in places exactly opposite to each other, and as one of them began first to decay, it gives a suspicion

that

that the last diseased was infected by that which received the first morbid impression.

On the contrary, we often see one diseased, whilst another Tooth, in contact with the decayed part, remains perfectly sound.

SYMPTOMS OF INFLAMMATION.

FEW or no symptoms are produced by this disease, besides the above appearances, till the cavity of he Tooth is exposed; however, it often happens that a tenderness, or a soreness upon touch, or other external influences, takes place long before; but when the cavity is exposed, then pain and other symptoms often begin, which are generally very considerable: however, the exposure of the cavity of a Tooth, does not in all cases give pain. Some Teeth shall moulder wholly away, without ever having any sensation.

In many cases there will be very acute pain upon the cavity being exposed, which will subside, and recur again, without producing any other effect; but it more frequently happens, that this pain is the first symptom of inflammation, and is in most cases very considerable;

more

more so than that arising from such an inflammation in other places. The surrounding parts sympathize commonly to a considerable extent, viz. the Gums, Jaw-bones, and integuments covering them; they inflame and swell so much as to affect the whole of that side of the face where the affected Tooth is situated. The mouth can hardly be opened; the glands of that side of the neck often swell; there is an increase of the saliva; and the eye is almost closed; the Tooth not giving way to the swelling of the soft parts within it: and for this reason, the local effects of the Inflammation cannot be so visible as in the soft parts.

This inflammation of the Tooth often lasts a considerable time, and then gradually subsides. We may suppose, according to the general law of inflammation, that it is at first of the adhesive kind, and accordingly we sometimes find the Teeth swelled at their ends, which is a character of the adhesive stage of inflammation; and sometimes two fangs are grown together. That we seldom find adhesions between the Teeth and surrounding parts, may be reasonably imputed to their less aptitude for such connexions. The suppurative inflammation succeeds; but as a Tooth has not that power of suppuration which leads to granulations, so as to be buried, covered up, and made part of ourselves, as happens to other bones (which would destroy any

use

use of a Tooth), the inflammation wears out, or rather the parts not being susceptible of this irritation, beyond a certain time, the inflammation gradually goes off, and leaves the Tooth in its original diseased state. No permanent cure therefore can possibly be effected by such inflammations; but the parts being left in the same state as before, they are still subject to repetitions of inflammation, till some change takes place, preventing future attacks, which I believe is generally, if not always, effected by the destruction of those parts which are the seat of it, viz. the soft parts within the Tooth.

Nature seems, in some measure, to have considered the Teeth as aliens, only giving them nourishment while sound and fit for service, but not allowing them when diseased the common benefits of that society in which they are placed. They cannot exfoliate, as no operations go on in them except growth; therefore, if any part is dead, the living has not the power of throwing it off, and forming an external surface, capable of supporting itself, like the other parts of the body: indeed, if they had such a power, no good purpose could be answered by it; for a piece of Tooth simply dead, is almost as useful as if the whole was living: which may be observed every day.

The pain, however, appears to take its rise from the Tooth as a centre. That it should be more severe than

what

what is generally produced by similar inflammations in other parts of the body, may perhaps be accounted for, when we consider, that these parts do not readily yield; as is likewise the case in whitloes.

It sometimes happens, that the mind is not directed to the real seat of the disease, the sensation of pain not seeming to be in the diseased Tooth, but in some neighbouring Tooth which is perfectly sound. This has often misled operators, and the sympathizing Tooth has fallen a sacrifice to their ignorance.

In all cases of diseased Teeth, the pain is brought on by circumstances unconnected with the disease; as for instance Cold, wherefore they are more troublesome commonly in winter than in summer. Extraneous matter entering the cavity, and touching the nerve and vessels, will also bring on the pain.

This pain is frequently observed to be periodical; sometimes there being a perfect intermission, sometimes only an abatement of it. The paroxysm comes on once in twenty-four hours; and, for the most part, towards the evening. The bark has therefore been tried; but that failing, the disorder has been suspected to be of the rheumatic kind, and treated accordingly with no better success. At length, after a more particular

ticular examination of the Teeth, one of them has been suspected to be unsound; and, being extracted, has put an end to the disorder. This shews how injudicious it is to give medicines in such cases, while the true state of the Tooth is unknown.

This disease is often the cause of bad breath, more so than any other disease of those parts; especially when it has exposed the cavity of the Tooth. This most probably arises from the rotten part of the Tooth, and the juices of the mouth, and food, all stagnating in this hollow part, which is warm, and hastens putrefaction in them.

I come now to the prevention and cure of this disease.

The first thing to be considered, is, the cure of the decaying state of the Tooth, or rather, the means of preventing the farther progress of the decay; and more especially before it hath reached the cavity, whereby the Tooth may be in some degree preserved; the consequent pain and inflammations, commonly called Tooth-ach, avoided, and often the consequent abscesses called Gum Boils. I believe, however, that no such means of absolute prevention are as yet

known. The progress of the disease, in some cases, appears to have been retarded, by removing that part which is already decayed; but experience shews, that there is but little dependence upon this practice. I have known cases where, the black spot having been filed off and scooped entirely out, the decay has stopped for many years. This practice is supposed to prevent at least any effect that the part already rotten may have upon the sounder parts; however, if this is all the good that arises from this practice, I believe, in most cases, it might be as well omitted. Even if it were an effectual practice, it could not be an universal one; for it is not always in the power of the operator to remove this decayed part, either on account of its situation, or on account of its having made too great a progress, before it is discovered. When it is on the basis of a grinder, or on the posterior side of its neck, it can scarcely be reached. It becomes also impracticable, when the disease is still allowed to go on, and the cavity becomes exposed, so that the patient is now liable to all the consequences already described, and the Tooth is making haste towards a total decay: in such a case, if the decay be not too far advanced, that is, if it be not rendered useless simply as a Tooth, I would advise that it be extracted; then immediately boiled, with a view to make it perfectly clean, and also destroy any life there may be in the Tooth; and then that it

be

be restored to the socket: this will prevent any farther decay of the Tooth, as it is now dead, and not to be acted upon by any disease, but can only suffer chymically or mechanically.

This practice, however, I would only recommend in grinders, where we have no other resource on account of the number of fangs, as will be more fully explained hereafter. This practice has sometimes been followed with success; and when it does succeed, it answers the same end as the burning the nerve, but with much greater certainty.

If the patient will not ſubmit to have the Tooth drawn, the nerve may be burned: that this may have the desired effect, it must be done to the very point of the fang, which is not always possible. Either of the concentrated acids, such as those of vitriol, nitre, or sea-salt, introduced as far into the fang of the Tooth as possible, is capable of destroying its soft parts, which most probably are the seat of pain: a little caustic alkali will produce the same effect. But it is a difficult operation to introduce any of these substances into the root of the fang, till the decay has gone a considerable length, especially if it be a Tooth of the Upper Jaw; for it is hardly possible to make fluids pass against their own gravity: in these cases, the common caustic is the best

application, as it is a solid. The caustic should be introduced with a small dossil of lint; but even this will scarcely convey it far enough. If it be the lower jaw, the caustic need only be introduced into the hollow of the Tooth; for, by its becoming fluid, by the moisture of the part, it will then descend down the cavity of the fang, as will also any of the acds; is but patients will often not suffer this to be done till they have endured much pain, and several inflammations.

When there is no other symptom except pain in the Tooth, we have many modes of treatment recommended, which can only be temporary in their effects. These act by derivation, or stimulus applied to some other part of the body. Thus, to burn the ear by hot irons, has sometimes been a successful practice, and has relieved the Tooth-ach.

Some stimulating medicine, as spirit of lavender snuffed up into the nose, will often carry off the pain.

When an inflammation takes place in the surrounding parts, it often is assisted by an additional cause, as cold, or fever: when the inflammation hath taken place in a great degree, then it becomes more the object of another consideration; for it may be lessened like any other inflammation arising from similar causes; the

pressure

pressure of an extraneous body, or exposure of an internal cavity.

If the inflammation be very great, it will be proper to take away some blood. The patient may likewise properly be advised to hold some strong vinous spirit, for a considerable time, in his mouth. Diluted acids, as vinegar, &c. may likewiss be of use, applied in the same manner. Likewise, preparations of lead would be adviseable; but these might prove dangerous, if they should be accidentally swallowed.

If the skin is affected, poultices, containing some of the above-mentioned substances, produce relief. The pain, in many cases, being often more than the patient can well bear, warm applications to the part have been recommended, such as hot brandy, to divert the mind; also spices, essential oils, &c. which last are, perhaps, the best. A little lint or cotton soaked in laudanum, is often applied with success; and laudanum ought likewise to be taken internally, to procure an interval of some ease. Blisters are of service in most inflammations of these parts, whether they arise from a diseased Tooth, or not. They cannot be applied to the part, but they divert the pain, and draw this stimulus to another part; they may be conveniently placed either behind the ear, or in the nape of the neck. These

last-

last-mentioned methods can only be considered as temporary means of relief, and such as only affect the inflammation. Therefore the Tooth is still exposed to future attacks of the same disease.

STOPPING OF THE TEETH.

IF the destruction of the life of the Tooth, either by drawing and restoring it again, or by the actual or potential cauteries, has not been effected, and only the cure of the inflammation has been attempted, another method of preventing inflammation is to be followed, which is to allow as little stimulus to take place as possible. The cavity of the Tooth not being capable of taking the alarm like most other cavities in the the body, and of course not suppurating, as has been already observed, often no more is necessary, either to prevent the inflammation from taking place altogether, or extending farther, than to exclude all extraneous irritating matter; therefore, the stopping up the cavity becomes, in many cases, the means of preventing future attacks of the inflammation, and often retards even the progress of the disease, that is, the farther decay of the Tooth; so that many people go on for years thus

thus assisted: but it is a method which must be put n practice early, otherwise it cannot be continued long; for, if the disease has done considerable damage to the inside of the Tooth, so as to have weakened it much, the whole body of the Tooth, most probably, will soon give way in mastication: therefore, under such circumstances, the patient must be cautioned, not to make too free with the Tooth in eating.

Gold and lead are the metals generally made use of for stopping Teeth. Gold being less pliable, must be used in the leaf; lead is so soft in any form, as to take on any shape by a very small force.

Stuffing the hollow Tooth with wax, galbanum, &c. can but be of very little service, as it is in most cases impossible to confine these substances, or preserve them from being soon worn away; however, they have their uses, as it is a practice which the patients themselves can easily put in execution.

It often happens from neglect, and much oftener in spite of all the means that can be used, that the Tooth becomes so hollow as to give way, whereby the passage becomes too large to keep in any of the above-mentioned substances; however, in this case, it sometimes happens that a considerable part of the body of the

the Tooth will still stand, and then a small hole may be drilled through this part; and after the cavity hath been well stopped, a small peg may be put into the hole, so as to keep in the lead, gold, &c. But when this cannot be done, we may consider the broken Tooth as entirely useless, or at least it will soon be so; and it is now open to attacks of inflammation, which the patient must either bear, or submit to have the Tooth pulled out. If the first be chosen, and the repeated inflammations submitted to, a cure will be performed in time, by the stump becoming totally dead; but it is better to have it pulled out, and suffer once for all.

Upon pulling out these Teeth, we may in general observe a pulpy substance at the root of the fang, so firmly adhering to the fang, as to be pulled out with it. This is in some pretty large, so as to have made a considerable cavity at the bottom of the socket. This substance is the first beginning of the formation of a Gum Boil, as it at times inflames and suppurates.

SECT. II.

THE DECAY OF THE TEETH, BY DENUDATION.

THERE is another decay of the Teeth much less common than that already described, which has a very singular appearance. It is a wasting of the substance of the Tooth very different from the former. In all the instances I have seen, it has begun on the exterior surface of the Tooth, pretty close to the arch of the gum. The first appearance is a want of enamel, whereby the bony part is left exposed; but neither the enamel nor the bony part alter in consistence as in the above-described decay. As this decay spreads, more and more of the bone becomes exposed, in which respect also it differs from the former decay; and hence it may be called a denuding process. The bony substance of the Teeth also gives way, and the whole wasted surface has exactly the appearance as if the Tooth had been filed with a rounded file, and afterwards had been finely polished. At these places the bony parts, being exposed, become brown.

I have seen instances, where it appeared as if the outer surface of the bony part, which is in contact with

the inner surface of the enamel, had first been lost; so that the attraction of cohesion between the two had been destroyed; and as if the enamel had been separated for want of support, for it is terminated all at once.

In one case, the two Incisors had lost the whole of the enamel; on their anterior surfaces they were hollowed from side to side, as if a round file had been applied to them longitudinally, and had the finest polish imaginable. The three Grinders on each side appeared as if a round file had been used on them, in a contrary direction to that on the Incisors, viz. across their bodies close to the gum, so that there was a groove running across their bodies, which was smooth in the highest degree. Some of the other Teeth in the same jaw had begun to decay in a similar manner; also, the Teeth in the Lower Jaw were become diseased.

I saw a case very lately, where the four Incisors of the Upper Jaw had lost their enamel entirely on their anterior surfaces, and there was scarcely a Tooth in the mouth which had not the appearance of having had a file applied across it close to the gum.

Those whom I have known, have not been able to attribute this disease to any cause; none of them had

ever

ever done any thing particular to the Teeth, nor was there in appearance any thing particular in the constitution, which could give rise to such a disease. In the first of these cases, the person was about forty; in the last, about twenty years of age.

From its attacking certain Teeth rather than others, in the same head, and a particular part of the Tooth, I suspect it to be an original disease of the Tooth itself; and not to depend on accident, way of life, constitution, or any particular management of the Teeth.

SECT. III.

SWELLING OF THE FANG.

ANOTHER disease of the Teeth is a swelling of the Fang, which most probably arises from inflammation, while the body continues sound; and is of that kind which in any other bone would be called a Spina Ventosa*. It gives considerable pain, and nothing can be seen externally.

The pain may either be in the Tooth itself, or the Alveolar Process, as it is obliged to give way to the increase of the Fang.

As a swelling of this kind does not tend to the suppurative inflammation, and as I have not been able to distinguish its symptoms from those of the nervous Tooth-ach, it becomes a matter of some difficulty to the operator; for the only cure yet known is the extraction

* Vide Natural History of the Teeth, page 37.

extraction of the Tooth; which has been often neglected on a supposition that the pain has been nervous.

These diseases of the Teeth, arising from inflammation, become often the cause of diseases in the Alveolar Processes, and Gums; which I shall proceed to describe.

SECT.

SECT. IV.

GUM-BILES.

ALTHOUGH suppuration cannot easily take place within the cavity of a Tooth, yet it often happens, that the inflammation, which is extended beyond it, is so great as to produce suppuration in the jaw, at the bottom of the socket, where the diseased Tooth is, forming there a small abscess, commonly called a Gum-bile.

This inflammation is often very considerable, especially when the first suppuration takes place. It is often more diffused than inflammations in other parts, and affects the whole face, &c.

The matter, as in all other abscesses, makes its own way outwards; and, as it cannot be evacuated through the Tooth, it destroys the Alveolar Processes, and tumifies the Gum, generally on the fore part, either pointing directly at the root of the Tooth, or separating the gum from it; and is evacuated in one or other of

these

these two ways, seldom on the inside of the Gum: however, this sometimes happens.

Gum-biles seldom arise from other causes; however, it sometimes happens that they originate from a disease in the socket or jaw, having no connexion with the Tooth, and only affecting it secondarily. Upon drawing such Teeth, they are generally found diseased at or near the point, being there very rough and irregular, similar to ulcerating bones. There is no disease to appearance in the body of the Tooth. These last described Gum-biles may arise wholly from such a cause, the appearance on the fang of the Tooth being only an effect.

These abscesses, whether arising from the Teeth or the sockets, always destroy the Alveolar Processes on that side where they open; as is very evident in the jaw-bones of many sculls: on which account, the Tooth becomes more or less loose. It may be perceived in the living body; for when the Alveolar Process is entirely destroyed on the outside of the Tooth, if that Tooth be moved, the motion will be observed under the Gum, along the whole length of the Fang.

So far the Teeth, Alveolar Processes, and Gums, become diseased by consent.

It

It is common for these abscesses to skin over, and, in all appearance, heal. This is peculiar to those which open through the Gums; but those which discharge themselves between the Gums and Teeth, can never heal up, because the Gum cannot unite with the Tooth; however, the discharge in them becomes less at times, from a subsiding of the suppuration; which indeed is what allows the other to skin over. But either exposure to cold, or some other accidental cause, occasioning a fresh inflammation, produces an increased suppuration, which either opens the old orifice in the Gum, or augments the discharge by the side of the Tooth; however, I believe, the inflammation in this last case is not so violent as in the other, where a fresh ulceration is necessary for the passage of the matter.

Thus a Gum-bile goes on for years, healing and opening alternately; the effect of which is, that the Alveolar Processes are at length absorbed, and the Tooth gets looser and looser, till it either drops out, or is extracted.

Most probably, in all such cases, the communication between the cavity of the Tooth and the Jaw, is cut off; yet it keeps in part its lateral attachments, especially when the Gum grasps the Tooth; but in those cases,

where

where the matter passes between the Gum and the Tooth, these attachments are less; but some of them are still retained, particularly on the side opposite to the passage for the matter.

Gum-biles are easily known. Those which open through the Gum may be distinguished by a small rising between the arch of the Gum, and the attachment of the lip: upon pressing the Gum at the side of this point, some matter will commonly be observed oozing out at the eminence. This eminence seldom subsides entirely; for even when there is no discharge, and the opening is healed over, a small rising may still be perceived, which shews that the Gum-bile has been there.

Those Gum-biles which discharge themselves between the Gum and the Tooth, are always discovered by pressing the Gum, whereby the matter is pressed out, and is seen lying in the angle between the Gum and Tooth.

These abscesses happen much more frequently in the upper jaw than in the lower, and also more frequently to the *Cuspidati*, *Incisores*, and *Bicuspides* in that jaw, than to the *Molares*; seldom to the fore Teeth in the lower jaw.

As Gum-biles are in general the consequence of rotten Teeth, we find them in young and middle-aged people more frequently than in old; but they appear to be most common to the Shedding-teeth. This will arise from those Teeth being more liable to become rotten; and perhaps there may be another reason, viz. the process of ulceration which goes on in these Teeth*, in some cases falling into suppuration.

It sometimes happens in these Gum-biles, that a fungus will push out at the orifice, from a luxuriant disposition to form granulations in the inside of the abscess, and the want of power to heal or skin; the same thing frequently happens in issues, where the parts have a disposition to granulate, but have not the power of healing, on account of an extraneous body being kept there. The Tooth in the present case acts as an extraneous body; and by the secretion of matter, the abscess is prevented from healing.

In the treatment of Gum-biles, the practice will be the same, whether the abscess has arisen from a diseased Tooth, or a disease in the socket. The

* Vide Natural History of the Teeth, for an Explanation of this Process in those Teeth, p. 98, 99.

The Teeth being under such circumstances in the animal machine, that they cannot partake of all the benefits of a cure in the same manner as other parts do; on that account, when an abscess forms itself about the root of a Tooth, the Tooth, by losing its connexion with the other parts, loses every power of union, as it is not endowed with the power of granulating, and thereby it becomes an extraneous body, or at least acts here as an extraneous body, and one of the worst kind, such as it is not in the power of any operation of the machine to get rid of. This is not the case with any other part of the body; for when any other part becomes dead, the machine has the power of separating it from the living, called sloughing or exfoliation, and expelling it, whence a cure is effected; but in the case of Gum-biles, the only cure of them is the extraction of the Tooth. As this is the last resource, every thing is to be done to make the parts as easy under the disease as possible, so that this operation may be postponed.

When the abscess has opened through the Gum, I believe the best method that can be tried, with a view to prevent future gatherings, is to prevent the closing up of the abscess; and this may be done, by enlarging the opening, and keeping it enlarged, till the whole internal surface of the cavity of the abscess is skinned over, or till the opening in the Gum loses the disposition to close up,

which will in a great measure prevent any future formation of matter; or at least, whatever is formed will find an easy outlet, which will prevent these accumulations from taking place ever after. The end of the fang will indeed be hereby exposed; but, under such circumstances, it will not be in a worse situation than when soaked in matter.

One method of doing this is to open the Gum-biles by a crucial incision, the full width of the abscess, and fill it well with lint, which should be dipped in lime-water, or a diluted solution of lunar caustic, made by dissolving one drachm of the caustic in two ounces of distilled water; and the wound should be dressed very frequently, as it is with difficulty that the dressing can be kept in. If this is not sufficient to keep the wound open, it may be touched with the lunar caustic, so as to produce a slough; and this may be repeated, if it should be found necessary.

One considerable disadvantage occurs in this practice, which is the difficulty of keeping on the dressings; but constant attention will make up for the inconvenience of situation.

If the surface of the abscess be touched with the lapis septicus, and the lip kept from coming in con-

tact

tact with the part for one minute, it answers better than any other method; for this, within that space of time, will penetrate to the bottom.

The surface of the bile should be first wiped dry, as much as the nature of the part will allow, to prevent as much as possible the spreading of the caustic; which by care can be prevented, as the operator will watch it the whole time.

To extract the Tooth, then to file off any diseased part of it, and immediately to replace it, has been practised, but often without the desired success; for it has often happened, that a Tooth has been introduced into a diseased jaw. This practice, however, now and then, has succeeded.

When a Gum-bile is formed on a back Tooth, or *Molares*, such very nice treatment is not necessary, as when it happens to the fore Teeth; because, appearances are there of less consequence: therefore, the gum may be slit down upon the fang through its whole length, from the opening of the Gum-bile to its edge, which will prevent any future union; and the whole cavity of the abscess, skinning over, will prevent any future collection of matter. The wound appears afterwards like the hare-lip, and therefore this practice is not adviseable

adviseable where it would be much in view, as when the disease is in the fore Teeth. In these cases, where the granulations push out through the small opening, they may be cured by the method above mentioned; but, if it is not complied with, they may be very safely cut off with a knife or launcet. However, this does not effect a cure; for they commonly rise again. To slit the gum, in this case, has been common; but it is a bad method, whenever the defect is in sight.

SECT.

SECT. V.

EXCRESCENCES FROM THE GUM.

FROM bad Teeth there are also sometimes excrescences, arising at once out of the Gum, near or in contact with the diseased Tooth.

In general they are easily extracted with a knife, or whatever cutting instrument can be best applied; but this will vary according to their situations, and the extent of their base.

They will often rise in a day or two after the operation as high as ever; but this newly-generated matter generally dies soon, and the disease terminates well. They have often so much of a cancerous appearance, as to deter surgeons from meddling with them; but where they arise at once from the Gum, and appear to be the only diseased part, I believe they have no malignant disposition.

However, I have seen them with very broad bases, and where the whole could not be removed, and yet no

no bad consequences have attended their removal. These often rise again in a few years, by which means they become very troublesome.

After the extirpation of them, it is often necessary to apply the actual cautery to stop the bleeding; for arteries going to increased parts are themselves increased, and also become diseased, and have not the contractile power of a sound artery.

SECT. VI.

DEEPLY-SEATED ABSCESSES IN THE JAWS.

SOMETIMES deeper Abscesses occur than those commonly called Gum-biles. They are often of very serious consequences, producing carious bones, &c. These commonly arise from a disease in the Tooth, and more especially in the *Cuspidati*, those Teeth passing farther into the jaw than the others. Their depth in the jaw being beyond the attachment of the lip to the gum, if an abscess forms at their points, it more readily makes its way through the common integuments of the face, than between the gum and lip, which disfigures the face; and when in the lower jaw, looks like the evil.

In the upper jaw, it makes a disagreeable scar on the face, about half an inch from the nose.

These, although they may sometimes arise from diseases of the Teeth and Gums, yet are properly the object of common surgery; and the Surgeon must

apply to the Dentist, if his assistance is necessary, to pull out the Tooth, or to perform any other operation which comes under his province.

It sometimes happens that the abscess is situated some way from the root of the diseased Tooth, both in the upper jaw and the lower; but, I think, more frequently in the lower. When it threatens to open externally on the skin of the face, great care should be taken to prevent it, and an opening very early made into the swelling on the inside of the lip; for it is generally very readily felt there. This practice of early opening these abscesses upon the inside of the mouth is more necessary, when the abcess is in the lower jaw, than when in the upper; because matter, by its weight, always produces ulceration more readily at the lower part. I have seen this practice answer, even when the matter had come so near the skin, as to have inflamed it. If it is in the upper, the opening need not be so very large; as the matter will have a depending outlet.

To prevent a relapse of the disease, it will in most cases be necessary to pull out the Tooth; which has either been the first cause, or has become diseased in consequence of the formation of the abscess; and in either case is capable of reproducing the disease.

The

The mouth should be often washed; and while the water is within the mouth, the skin should be pressed opposite to the abscess.

If the life of the bone be destroyed, it will exfoliate; and very probably two or three of the Teeth may come away with the exfoliation. Little should be done in such cases, except that the patient should keep the mouth as clean as possible, by frequently washing it; and when the bones exfoliate, they should be removed as soon as possible. In these cases, it is but too common for the Dentist to be very busy, and perhaps do mischief through ignorance.

SECT. VII.

ABSCESS OF THE ANTRUM MAXILLARE.

THE *Antrum Maxillare* is very subject to inflammation and suppuration, by means of diseases of the neighbouring parts, and particularly of the duct leading to the nose being obliterated. Whether this is the cause, or only an effect, is not easily determined; but there is great reason to suppose it an attendant, from some of the symptoms. If it be a cause, we may suppose, that the natural mucus of these cavities, accumulating, irritates and produces inflammation for its own exit; in the same manner as an obstruction to the passage of the Tears through the *ductus ad Nasum*, produces an abscess of the *lachrymal sac*.

This inflammation of the *Antrum* gives a pain which will be at the first taken for the Tooth-ach, especially if there be a bad Tooth in that side; however, in these cases, the nose is more affected than commonly in a Tooth-ach.

The

The eye is also affected; and it is very common for people with such a disease to have a severe pain in the forehead, where the frontal sinuses are placed; but still the symptoms are not sufficient to distinguish the disease. Time must disclose the true cause of the pain; for it will commonly continue longer than that which arises from a diseased Tooth, and will become more and more severe; after which, a redness will be observed on the fore part of the cheek, somewhat higher than the roots of the Teeth, and a hardness in the same place, which will be considerably circumscribed. This hardness may be felt rather highly situated on the inside of the lip.

As this disease has been often treated of by surgeons, I shall only make the following remarks concerning it:

The first part of the cure, as well as of that of all other abscesses, is to make an opening, but not in the part where it threatens to point; for that would generally be through the skin of the cheek.

If the disease is known early, before it has caused the destruction of the fore part of the bone, there are two ways of opening the abscess; one, by perforating the partition between the antrum and the nose, which may be done; and the other, by drawing the first or second

grinder

grinder of that side, and perforating the partition between the root of the alveolar process and the antrum; so that the matter may be discharged for the future that way.

But if the fore part of the bone has been destroyed, an opening may be made on the inside of the lip, where the abscess most probably will be felt; but this will be more apt than the other perforation to heal, and thereby may occasion a new accumulation; which is to be avoided, if possible, by putting in practice all the common methods of preventing openings from healing or closing up: but this practice will rather prove troublesome; therefore the drawing the Tooth is to be preferred, because it is not so liable to this objection.

CHAP.

CHAP. II.

Of the Diseases of the Alveolar Processes, and the Consequences of them.

HAVING thus far treated of the diseases of the Teeth themselves, and those of the Sockets and Gums, which either arise from them, or are similar to such as arise from them, I come now to consider the diseases which take place primarily in the Sockets, when the Teeth are perfectly sound: these appear to be two; and yet I am not sure but that they are both fundamentally the same, proceeding together from the same cause, or one depending on the other.

The first effect which takes place, is a wasting of the Alveolar Processes, which are in many people gradually absorbed, and taken into the system. This wasting begins first at the edge of the socket, and gradually goes on to the root or bottom.

The

The Gum, which is supported by the Alveolar Process, loses its connexion, and recedes from the body of the Tooth in proportion as the socket is lost; in consequence of which, first the neck, and then more or less of the fang itself, becomes exposed. The Tooth of course becomes extremely loose, and at last drops out.

The other effect is a filling up of the socket at the bottom, whereby the Tooth is gradually pushed out. As this disease seldom happens without being attended by the other, it is most probable that they generally both arise from the same cause. The second in these cases may be an effect of the first. Both combine to hasten the loss of the Tooth; but it sometimes happens that they act separately; for I have seen cases where the Gum was leaving the Teeth, and yet the Tooth was not in the least protruded; on the other hand, I have seen cases where the Tooth was protruding, and yet the Gum kept its breadth; but where this is not the case, and the Gums give way, the Gums generally become extremely diseased; and as they are separated from both the Teeth and the Alveolar Process, there is a very considerable discharge of matter from those detached surfaces.

Though the wasting of the Alveoli at their mouths, and the filling up at their bottoms, are to be considered

as

as diseases, when they happen early in life; yet it would appear to be only on account of a natural effect taking place too soon; for the same thing is very common in old age*: and also, as this process of filling up the bottom, and wasting of the mouths of the Alveolar Processes, takes place in all ages, where a Tooth has been drawn, and the connexion between the two parts is destroyed, this might lead us to suspect, that the original cause of these diseases may be a want of that perfect harmony which is required between the Tooth and Socket, whereby a stimulus may be given in some degree similar to the loss of a Tooth; and, by destroying that stimulus upon which the absorption of the process and the filling up of the socket depend, the natural disposition may be restored. This last opinion is strengthened by the following case:

One of the first Incisores of the Upper Jaw of a young lady was gradually falling lower and lower. She was desirous of having a Tooth transplanted, which might better fit the shallow socket, as it was now become: she consulted me: I objected to this, fearing that the same disposition might still continue; in which case the new Tooth would be probably pushed out in about half a year; that the time since the old one began to sink, and a relief of so short a continuance, would

* Vide Natural History of the Teeth, page 7.

be all the advantage gained by the operation; but I observed at the same time, that the operation might have the effect of destroying the disposition to filling up, so that the new Tooth might keep its ground. This idea turned the balance in favour of the operation; and it was performed. Time shewed that the reasoning was just: the Tooth fastened, and has kept in its situation for some years.

These diseases arise often from visible causes. Any thing that occasions a considerable and long-continued inflammation in those parts, such particularly as a salivation, will produce the same effect. The scurvy also, when carried to a great height, attacks the Gums and the Alveolar Processes, which becomes a cause of the dissolution of those parts. This is most remarkable in the scurvy at sea.

When the disease arises from these two last causes, the Gums are either affected with the same disease, together with the Alveolar Processes, or they sympathize with them. They swell, become soft and tender; and, upon the least pressure or friction, bleed very freely.

How far these diseases can be prevented and cured, is, I believe, not known.

The

The practice hath been principally to scarify the Gums freely; and this with a view to fasten the Teeth made loose by the disease, which has therefore generally made a considerable progress before even an attempt towards a cure has been made. This scarification has certainly a good effect in some cases, the Teeth thereby becoming much faster; but how far the Alveolar Processes have been destroyed in such instances, cannot be determined. Perhaps, only a general fullness of the attaching membrane, between the Tooth and the Process, had taken place, as in a slight salivation, so as to push the Tooth a little way out of the bony socket; which having subsided by the plentiful bleeding, the Tooth of course becomes fast. Or perhaps, by producing an inflammation of another kind, the first inflammation or disposition to inflame is destroyed; which evidently appeared in the case of the young lady above mentioned.

If the above practice is unsuccessful, and the Tooth continues to protrude, it will either become very troublesome, or a great deformity. A fore Tooth may not, indeed, be at first so troublesome as a Grinder; because these Teeth frequently *overlop*; but it will be extremely disagreeable to the eye.

If the cause cannot be removed, the effect must be the object of our attention. To file down the pro-

jecting part is the only thing that can be done; but care must be taken not to file into the cavity, otherwise pain, inflammation, and other bad consequences, may probably ensue. This practice, however, will be very troublesome, because it will be difficult to file a loose Tooth. At last the Tooth will drop out, which will put an end to all farther trouble.

If the Alveoli have really been destroyed, in those cases of loose Teeth which have become firm again, it would be difficult to ascertain whether they have a power of renewing themselves, analogous to that power by which they first grow, or whether the fastening be effected by a closing of the Gum and Process to the Teeth. When the disease arises from the scurvy, the first attempt must be to cure that disease; and afterwards the above local treatment may be of service.

Together with drawing blood from the Gums, astringents have always been used to harden them. But when the disease does not arise from a constitutional cause, which may be removed, (such as the sea-scurvy or salivation) but from a disposition in the parts themselves, I have seen little relief given by them.

The tincture of myrrh, tincture of Peruvian bark, and sea-water, are some of the applications which have been recommended.

In

In such cases, I have seen considerable benefit from the use of the tincture of bark and laudanum, in the proportion of two parts of the tincture of bark to one of the laudanum; and this to be used frequently, and at each time to be kept in the mouth during ten, fifteen, or twenty minutes.

CHAP.

CHAP. III.

Of the Diseases of the Gums, and the Consequences of them.

SECT. I.

THE SCURVY OF THE GUMS *(vulgarly so called).*

THE Gums are extremely subject to diseases, the symptoms of which, in an advanced state of them, are in general such as were described in the preceding chapter.

They swell, become extremely tender, and bleed upon every occasion; which circumstances being somewhat similar to those observable in the true Scurvy, the disease has generally been called a Scurvy in the Gums.

But as this seems to be the principal way in which the Gums are affected, I suspect that the same symptoms may arise from various causes; as I have often seen the same appearances in children, evidently of a

scrofulous

scrofulous habit; and have also suspected them in grown people: they likewise frequently appear in persons who are, in all other respects, perfectly healthy.

When the Gums first begin to have a tenderness, we may observe it first on their edges: the common smooth skin of the Gum is not continued to its very edge, but becomes at the edge a little rough like a border, and somewhat thickened. The part of the Gum between two Teeth swells, and often pushes out like luxuriant flesh, which is frequently very tender.

The inflammation is often carried so far as to make the the Gums ulcerate; so that the Gums in many cases have a common ulcer upon them; by which process a part of the Teeth are denuded. This is often on one part only, often only on one jaw; while in some cases it is on the whole Gums on both jaws.

In this case it often happens, that the Alveolar Process disappears, after the manner above described (*see page* 48), by taking part in the inflammation, either from the same cause, or from sympathy. In such cases there is always a very considerable discharge of matter from the inside of the Gum and Alveolar Process,

Process, which always takes the course of the Tooth for its exit.

In many of these cases we find, that while the Gums are ulcerating in one part, they are swelling and becoming spongy in another, and hanging loose upon the Teeth; and this often takes place where there is no ulceration in any part.

The treatment proper in this disease, where the Gums become luxuriant from a kind of tumefaction, is generally to cut away all the redundant swellings of the Gum. I have seen several instances where this has succeeded; but still I am inclined to think, that this is not the best practice; for it is not that an adventitious substance is thus removed, as in the case of luxuriant granulations, from a sore, but a part of the Gum itself is destroyed, in like manner as a part enlarged by inflammation may be reduced by the knife to its natural size; which would certainly be bad practice. I should suspect, that the good arising from such practice is owing to the bleeding which takes place; especially, as I have found from experience, that simply scarifying the Gums has answered the same purpose. Where there are reasons for supposing it to arise from a peculiarity in the constitution, the treatment should be such as will remove this peculiarity.

If the constitution is scorbutic, it must be treated with a view to the original disease. If scrofulous, local treatment, by wounding the parts, may do harm; but sea-bathing, and washing the mouth frequently with sea-water, are the most powerful means of cure that I know.

SECT. II.

CALLOUS THICKENINGS OF THE GUMS.

THE Gums are also subject to other diseases, abstracted from their connexion with the Alveoli and Teeth; which do not wholly belong to our present subject.

A very common one is the thickening of the Gum in some particular place, of a hard callous nature, similar to an excrescence. Many of these have a cancerous appearance, which deters the surgeon from meddling with them; but in general, without reason.

They may be often removed by the knife, but not always. The bleeding, which follows, is generally so considerable, that it is frequently necessary to apply the actual cautery.

They sometimes grow again, which subjects the patient to the same operation. I have known them extracted six times; but, in such cases, I suspect that they

they really have a cancerous disposition; at least, it has been so in two cases which have fallen under my observation.

But here the skill of the surgeon, rather than that of the dentist, is required.

CHAP. IV.

Of Nervous Pains in the Jaws.

THERE is one disease of the Jaws which seems in reality to have no connexion with the Teeth, but of which the Teeth are generally suspected to be the cause. This deserves to be taken notice of in this place, because operators have frequently been deceived by it, and even sound Teeth have sometimes been extracted through an unfortunate mistake.

This pain is seated in some one part of the Jaws. As simple pain demonstrates nothing, a Tooth is often suspected, and is perhaps drawn out; but still the pain continues, with this difference however, that it now seems to be in the root of the next Tooth: it is then supposed either by the patient, or the operator, that the wrong Tooth was extracted; wherefore, that in which the pain now seems to be, is drawn, but with as little benefit. I have known cases of this kind, where all the Teeth of the affected side of the Jaw have been drawn out, and the pain has continued in

the

the Jaw; in others, it has had a different effect, the sensation of pain has become more diffused, and has at last attacked the corresponding side of the tongue. In the first case, I have known it recommended to cut down upon the Jaw, and even to perforate and cauterise it, but all without effect.

Hence it should appear, that the pain in question does not arise from any disease in the part, but is entirely a nervous affection.

It is sometimes brought on, or increased, by affections of the mind, of which I once saw a remarkable instance in a young lady.

It often has its periods, and these are frequently very regular.

The regularity of its periods gives an idea of its being a proper case for the bark, which however frequently fails.

I have seen cases of some years standing, where the hemlock has succeeded, when the bark has had no effect; but sometimes all attempts prove unsuccessful. Sea-bathing has been in some cases of singular service.

CHAP. V.

Of the Extraneous Matter upon the Teeth.

THERE are parts of the Tooth which lie out of the way of friction, viz. the angles made by two Teeth, and the small indentation between the Tooth and Gum.

Into these places the juices are pressed, and there stagnate, giving them at first the appearance of being stained or dirty. A Tooth in this stage is generally clean for some way from its cutting edge, towards the gum, on account of the motion of the lips upon it, and the pressure of the food, &c. It is also pretty clean close to the Gum, from the motion of the loose edge of the Gum upon that part; but this circumstance is only observable in those who have their Gums perfectly sound; for in others, this loose edge of the Gum is either lost, or no longer retains its free motion.

If art be not now used, as the natural motion of the parts is not sufficient, the incrustation increasing covers more

more and more of the Teeth. As mastication generally keeps that part clear which is near to the edges and grinding surfaces, and as the motion of the lips in some measure retards its growth outwards, it accumulates on the parts above mentioned, till it rises almost as high as the Gum: its growth being now retarded in that direction, it accumulates on the edge next to the Gum, so that in time it passes over the Gum, of which it covers a greater or less portion. When it has increased so much as to touch the Gum (which very soon happens, especially in the angle between the Teeth), it produces ulceration of that part, and a train of bad consequences. Often the Gums receding from this matter, become very tender and subject to hemorrhage.

The Alveolar Processes frequently take part with the Gums, and ulcerate; so that the Teeth are left without their support, and at last drop out, similarly to the diseases of these parts already described.

All our juices contain a considerable quantity of calcareous earth, which is dissolved in them, and which is separated from them upon exposure, which continues mixed with the Mucus; so that the extraneous matter consists of earth and the common secreted Mucus *.

This

* Vide Natural History, page 125, in the Note, for a further description of this.

This disposition of the juices of the mouth to abound so much with earth, seems to be peculiar to some people, perhaps to some constitutions; but I have not been able to ascertain what these are. We find persons who seem to have nothing particular, either in constitution or way of life, so subject to this accumulation, that the common methods of prevention, such as washing and brushing the Teeth, have not the desired effect.

The disposition is so strong in some people, that the concretion forms on the whole body of the Tooth; I have seen it even on the grinding surface of the *Molares*, and often two or three Teeth are cemented together with it. This I think could only happen to those who seldom or never use these Teeth. It is very apt to accumulate on a Tooth, the opposite of which is lost.

I once saw a case of this kind, where the accumulation, which was on a grinder, appeared like a tumour on the inside of the mouth, and made a rising in the cheek, which was supposed by every one that felt it, to be a scirrhous tumour forming on the cheek; but it broke off, and discovered what it was.

This accumulation is very apt to begin during a fit of sickness, when the extraneous juices are allowed

to

to rest; and perhaps the juices themselves may have at this time a greater tendency to produce the incrusting matter.

It may also arise from any circumstance which prevents a person from eating solids, whereby the different parts of the mouth have less motion on each other. Lying-in women are instances of this; not to mention that the assistance of art in keeping the Teeth clean is commonly wanting under such circumstances.

The adventitious substance, as was said before, is composed of mucus or animal juices, and calcareous earth; the earth is attached to and crystallized upon the Tooth, and the mucus is entangled in these crystals.

The removal of this adventitious matter is a part in which the dentist ought to be very cautious: he should be perfectly master of the difference between the natural or original Tooth, and the adventitious matter; and he should be sensible of the propriety of saving as much as possible of the Tooth, and at the same time take pains to remove all that which is not natural. Many persons have had their teeth wholly spoiled by an injudicious treatment of them in this respect.

As the cause of this incrustation is not either a known disease of the constitution, or of the parts, but depends on a property of the matter secreted, simply as inanimate matter, the remedy of course becomes either mechanical or chemical.

The mechanical remedies are friction, filing, and picking. The first is sufficient, when the Teeth are only beginning to be discoloured; or, when already clean, they may be thus kept clean. Various are the methods proposed; to wash them with cold water, and at the same time to rub them with a piece of cloth on the fore finger, has been thought sufficient by some; others have recommended the dust of a burnt cork, burnt bread, &c. with a view to act with more power on the adventitious matter, than what can be applied by the means of a soft brush or cloth.

In cases where this incrustation has been more considerable, powders of various kinds have been employed, such as tartar, bole, and many others.

Cream of tartar is often used, which at the same time that it acts mechanically, has likewise a chymical power, and dissolves this matter.

Other mechanical means are instruments to pick, scrape, and file off the calcareous earth; these should only

only be made use of when it is in large quantities, and with great caution, as the Teeth may be somewhat loose; or, a part of the Tooth may be broken off with the incrustation.

The chymical means are solvents: these are either alkalies or acids. The alkaline salt will answer very well early in the disease; for the crust in the first stage consists chiefly of mucus, which the alkali will remove very readily; but it should not be used too freely, as it rather softens the Gums, and makes them extremely tender.

Acids are also employed with success, as they dissolve the earth, but are attended with this disadvantage, that they act with more force upon the Tooth itself, dissolving part of it, which is to be avoided, if possible; for no part of a sound Tooth can be spared.

We may observe, that people who eat a good deal of salad or fruit, have their Teeth much cleaner than common; which is owing to the acids in those fruits; and for the same reason people's Teeth are commonly cleaner in summer than winter, in those countries where there is a great plenty of fruit. When the accumulation has been considerable, the Teeth and Gums will feel tender on the removal of this matter, and even be affected by cold air; but this will not be of long continuance.

CHAP. VI.

Of the Irregularity of the Teeth.

As that part of each jaw, which holds the ten fore-teeth, is exactly of the same size when it contains those of the first set, as when it contains those of the second; and as these last often occupy a much larger space than the first*; in such cases the second set are obliged to stand very irregularly.

This happens much oftener in the upper jaw, than in the lower; because, the difference of the size of the two sets is much greater in that jaw.

This irregularity is observed almost solely in the Incisores and Cuspidati; for they are the only Teeth which are larger than their predecessors.

It most frequently happens to the Cuspidati, because they are often formed later than the Bicuspides; in consequence of which, the whole space is taken up before they make their appearance: in such cases they are

* Vide Natural History, p. 101, 102, Pl. 6. fig. 2.

are obliged to shoot forwards or outwards over the second Incisor. However, it frequently happens to the Incisores, but seldom to such a degree. This arises often from the temporary cuspidatus of one or both sides standing firm. I have seen the irregularities so much as to appear like a double row.

The Bicuspidati generally have sufficient room to grow, because even more space than what they can occupy, is kept for them by the temporary grinders*. This however is not universally the case; for I have seen where the Bicuspidati were obliged to grow out of the circle, very probably from their being later in growing than common.

That it is from want of room in the jaw, and not from any effect that the first set produce upon them is evident; first, because in all cases of irregularity we find that there is really not room in the jaw, to allow of placing all the Teeth properly in the circle; so that some are necessarily on the outside of the circle, others within it; while others are turned with their edges obliquely as it were, warped; and secondly, because the Bicuspides are not out of the circle, although they are as much influenced by the first set as any of the others.

As

* Vide Natural History, page 83.

As they are not influenced by the first set, it cannot be of any service to draw the first possesor; for that gives way in the same proportion as the other advances. As the succeeding Tooth, however, is broader, it often interferes with a Shedding-tooth next to it, the fang of which not being influenced by the growth of its own succeeding Tooth, it does not decay in proportion as the other advances; and therefore the drawing of the adjoining Shedding-tooth is often of service*.

In cases of considerable irregularity, for want of room, a principal object is to remove those which are most out of their place, and thereby procure room for the others, which are to be brought into the circle.

To extract an irregular Tooth would answer but little purpose, if no alteration could be made in the situation of the rest; but we find that the very principle upon which Teeth are made to grow irregularly, is capable, if properly directed, of bringing them even again. This principle is the power which many parts (especially bones) have of moving out of the way of mechanical pressure.

The

* Vide Natural Hist. page 107.

The irregularity of the Teeth is at first owing to mechanical pressure; for one Tooth getting the start of another, and fixing firmly in its place, becomes a resistance to the young, loose, forming Tooth, and gives it an oblique direction. The same principle takes place in a completely formed Tooth, whenever a pressure is made upon it. Probably a Tooth might by slow degrees be moved to any part of the mouth; for I have seen the Cuspidati pressed into the place of the Incisores. However, it is observed, that the Teeth are easier moved backwards than forwards; and when moved back, that they are permanent, but often, when moved forwards, they are very apt to recede.

The best time for moving the Teeth is in youth, while the jaws have an adapting disposition; for, after a certain time, they do not so readily suit themselves to the irregularity of the Teeth. This we see plainly to be the case, when we compare the loss of a Tooth at the age of fifteen years, and that of thirty or forty. In the first case, we find that the two neighbouring Teeth approach one another, in every part alike, till they all close; but in the second, the distance in the jaw, between the two neighbouring Teeth, remains the same, while the bodies will in a small degree incline to one another from want of lateral support.*

And

* Vide Natural Hist. Plate XVI. Fig. 1, *a*, *b*, *c*.

And this circumstance of the bodies of the Teeth yielding to pressure upon their base, shews that, even in the adult, they might be brought nearer to one another by art properly applied.

As the operation of moving the Teeth is by lateral pressure upon their bodies, these bodies must first have passed through the gum sufficiently for a hold to be taken.

The best time seems to be, when the two grinders of the child have been shed; for at this time a natural alteration is taking place in that part of the jaw.

The means of making this pressure I shall only slightly describe, as they will greatly vary according to circumstances; so considerably indeed, that scarcely two cases are to be treated alike, and in general the dentists are tolerably well acquainted with the methods.

In general, it is done with ligatures or plates of silver. The ligatures answer best when it is only required to bring two Teeth closer together, which are pretty much in the circle. The trouble attending this is but trifling, as it is only that of having them tied once a week or fortnight.

Where Teeth, growing out of the circle, are to be brought into it, curved silver plates, of a proper construction, must be used. These are generally made to act on three points, two fixed points on the standing Teeth, and the third on the Tooth which is to be moved. That part of the plate which rests on the two standing Teeth must be of a sufficient length for that purpose, while the curved part is short, and goes on the opposite side of the Tooth to be moved. Its effect depends very much on the attention of the patient, who must frequently press hard upon it with the Teeth of the opposite jaw; so that this method is much more troublesome to the patient than the ligature.

It is impossible to give absolute directions what Tooth or Teeth ought to be pulled out. That must be left to the judgment of the operator; but the following general hints may be of service:

1. If there is any one Tooth very much out of the row, and all the others regular, that Tooth may be removed, and the two neighbouring ones brought closer together.

2. If there are two or more Teeth of the same side very irregular (as, for instance, the second Incisor and

Cuspidatus), and it appears to be of no consequence with respect to regularity, which of them is removed, I should recommend the extraction of the farthest back of the two, viz. the Cuspidatus; because, if there should be any space, not filled up, when the other is brought into the row, it will not be so readily seen.

3. If the above-mentioned two Teeth are not in the circle, but still not far out of it, and yet there is not room for both; in such a case I would recommend the extraction of the first Bicuspis, although it should be perfectly in the row, because the two others will then be easily brought into the circle; and, if there is any space left, it will be so far back as not to be at all observable.

The upper jaw is often rather too narrow from side to side, near the anterior part which supports the fore Teeth, and projects forwards considerably over the lower, giving the appearance of the rabbit-mouth, although the Teeth be quite regular in the circle of the jaw.

In such a case it is necessary to draw a Bicuspis of each side, by which means the fore part of the circle will fall back; and if a cross bar was to be stretched from side to side across the roof of the mouth, between cuspis and cuspis, it would widen the circle. The

fore

fore Teeth might also be tied to this bar, which would be a means of assisting nature in bringing them back. This has been practised, but it is troublesome.

As neither the bodies nor the fangs of the Teeth are perfectly round, we find that this circumstance often becomes a cause of their taking a twist; for, while growing, they may press with one edge only on the completely formed Tooth; by which means they will be turned a little upon their centre.

The alteration of these is more difficult than of the former, for it is in general impossible to apply, so long and constantly as is necessary for such an operation, any pressure that has the power of turning the Tooth upon its centre. However, in the Incisores, it may be done by the same powers which produce the lateral motion; but where these cannot be applied, as is frequently the case, the Tooth may be either pulled out entirely, and put in again even, or it may be twisted round sufficiently to bring it into a proper position, as hath been often practised.

It may not be improper, in this place, to take notice of a case which frequently occurs. It is a decay of the first adult grinder at an early age, viz. before the temporary grinders are shed, and before the second grinder

of the adult has made its appearance through the gum. In this case, I would recommend removing the diseased Tooth immediately, although it may occasion no kind of trouble; for, if it be drawn before the temporary grinders are shed, and before the second adult grinder has cut the gum, it will in a short time not be missed; because the bicuspis of that side will fall a little back, and the second and third grinders will come a little forward; by which means the space will be filled up, and these Teeth will be well supported. Besides, the removal of this Tooth will make room for the fore Teeth, which is often very much wanted, especially in the upper jaw.

CHAP. VII.

Of Irregularities between the Teeth and Jaw.

CERTAIN disproportions, between the Teeth and Jaw, sometimes occur; one of which is, when the body of the lower jaw is not of sufficient length for all the Teeth. In such cases, the last grinder never gets perfectly from under the coronoide process, its anterior edge only being uncovered; and the gum, which still in part lies upon the Tooth, is rubbed against the sharp points of the Tooth, and is often squeezed between the Tooth upon which it lies, and the corresponding one of the upper jaw. This occasions so much uneasiness to the patient, that it becomes necessary to relieve the gum, if possible, by dividing it freely in several places, that it may shrink and leave this surface of the Tooth wholly uncovered. If this does not answer, which is sometimes the case, it is adviseable to draw the Tooth.

Sometimes, although but seldom, an inconvenience arises from the *dentes sapientiæ* being in the upper jaw, and not in the lower; these Teeth pressing upon

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the anterior part of the root of the coronoide process, when the mouth is shut; for the coronoide processes are farther forwards in such cases, than when the lower jaw also has its *dentes sapientiæ:* in short, the exact correspondence between the two jaws is not kept up.

In such cases I know of no other remedy, but the extraction of the Tooth.

Of Supernumerary Teeth.

WHEN there are Supernumerary Teeth*, it will in general be proper to have them drawn; for they are commonly either troublesome, or disfigure the mouth,

* Vide Natural History, page 105.

CHAP. VIII.

Of the Under Jaw.

IT is not uncommon to find the lower Jaw projecting too far forwards, so that its fore Teeth pass before those of the upper Jaw, when the mouth is shut*; which is attended with inconvenience, and disfigures the face.

This deformity can be greatly mended in young people. The Teeth in the lower Jaw can be gradually pushed back in those whose Teeth are not close, while those in the upper can be gently brought forward; which is by much the easiest operation.

These two effects are produced by the same mechanical powers. While this position of the Jaw is only in a small degree, so that the edges of the under Teeth can be by the patient brought behind those of the upper, it is in his own power to increase this, till the whole be completed; that is, till the grinders meet; and it is not necessary to go further. This is done by frequently bringing

* Vide Natural History, page 70.

bringing the lower Jaw as far back as he can, and then squeezing the Teeth as close together as possible.

But when it is not in the person's power to bring the lower Jaw so far back as to allow the edges of its fore Teeth to come behind those of the upper, artificial means are necessary.

The best of these means is an instrument of silver, with a socket or groove, shaped to the fore Teeth of the lower Jaw, to receive them, so as to become fast to them, and sloped off as it rises to its upper edge, so as to rise behind the fore Teeth in the upper Jaw in such a manner, that, upon shutting the mouth, the Teeth of the upper Jaw may catch the anterior part of the slanting surface, and be pushed forward with the power of the inclined plane. The patient, who wears such an instrument, must frequently shut his mouth with this view.

These need not be continued longer than till the edges of the lower Teeth can be got behind those of the upper; for it is then within the power of the patient, as in the first-stated case.

CHAP. IX.

Of Drawing the Teeth.

THE extraction of Teeth is, in some cases, an operation of considerable delicacy; and, in others, no operation is less difficult.

As this is often not thought of till an inflammation has come on, it becomes an object of consideration, whether it be proper to remove the Tooth while that inflammation continues, or to wait till it has subsided. I am apt to believe, it is better to wait even till the parts have perfectly recovered themselves, because the state of irritation renders them more susceptible of pain. The contrary practice might also appear reasonable; for by removing the Tooth, it might be imagined that we should remove the cause; but when the inflammation has once begun, the effect will go on independently of the cause; and to draw the Tooth, in such a situation, is rather to produce a fresh cause, than to remove the present. Of this I think an

instance has occurred to me. However, most Teeth are drawn in the height of inflammation; and, as we do not find any mischief from the operation, it is perhaps better to do it when the resolution of the patient is the greatest. The sensibility of the mind may even be less at this time.

Teeth are easy or difficult of extraction, according as they are fast or loose in their sockets; in some degree according to the kind of Tooth, and also, in some degree, with reference to their situation*.

They are naturally so fast as to require instruments, and the most cautious and dexterous hand; and yet are sometimes loose enough to be pulled out by the fingers.

When the sockets and gums are considerably decayed, and the Tooth or Teeth very loose, it would in most cases be right to perform extraction; for when they are allowed to stay, and perhaps are kept in their proper place, by being tied to the neighbouring Teeth, they then act upon the remaining gum and socket as extraneous bodies, producing ulceration there, and making those parts recede much farther than they naturally would have done, if the Tooth had been drawn earlier; which

* For farther directions, vide Natural History, page 122.

which produces two bad effects; it weakens the lateral support of the two neighbouring Teeth, and it renders it more difficult to fix an artificial Tooth. But unless these two last circumstances are forcibly impressed upon the patient, it is hardly possible to persuade him to consent to the loss of a Tooth while it has any hold, especially a tooth which appears sound.

The extraction should never be done quick; for this often occasions great mischief, breaking the Tooth or jaw; on the same principle as a bullet going against an open door with great velocity, will pass through it, but, with little velocity, will shut it.

This caution is most necessary in adults, or in the permanent Teeth*; for, in young subjects, where there are only the temporary Teeth†, the jaw, not being so firm, the Tooth is not in much danger of being broken‡.

* Vide Natural History, page 83.

† Vide Natural History, page 98, Fig. XV.

‡ I must do Mr. Spence the justice to say, that this method appears to be peculiar to him, and that he is the only operator I ever knew who would submit to be instructed, or even allow an equal in knowledge; and I must do the same justice to both his sons.

It is a common practice to divide the gum from the Tooth before it is drawn, which is attended with very little advantage; because at best it can only be imperfectly done, and that part of the gum which adheres to the Tooth, decays when it is lost. But if such a separation as can be made, saves any pain in the whole of the operation, I should certainly recommend it; and at least in some cases, it might prevent the gum from being torn. It is also a common practice, to close the gum, as it is termed: this is more for shew than use; for the gum cannot be made so close as to unite by the first intention; and therefore the cavity from which the Tooth came, must suppurate like every other wound. But, as the sensations of these parts are adapted to such a loss, and as a process very different from that which follows the loss of so much substance in any other part of the body, is to take place; the consequent inflammations and suppurations are not so violent*. We may be allowed to call this a natural operation which goes on in the Gum and Alveoli, and not a violence; as we see that the delivery of a young animal before its time, which is similar to the drawing of a fixed Tooth, in happening before all the containing parts are prepared for the loss, produces considerable local violence, without doing proportionable mischief. Therefore, in general, it is very unnecessary to do any thing at all to the gum. There

* Vide Natural History, on the decay of the Alveoli, page 7.

There are some particular circumstances which naturally, and others which accidentally attend and follow the drawing of Teeth; but they are in general of no great consequence.

There follows a bleeding from the vessels of the socket, and those passing between it and the Teeth*. This commonly is but trifling; however, instances have occurred where it has been very considerable, and the aukwardness of the situation makes it very difficult to stop it. In general, it will be sufficient to stuff the socket with lint, or lint dipped in the oil of turpentine, and to apply a compress of lint, or a piece of cork, thicker than the bodies of the adjacent Teeth; so that the Teeth in the opposite jaw may keep up a pressure.

It has been advised to stuff into the socket some soft wax, on a supposition that it would mould itself to the cavity, and so stop the bleeding; this perhaps may sometimes answer better than the other method, and therefore should be tried when that fails.

It is scarcely possible to draw some Teeth without breaking the Alveolar Processes. This in general is but of little consequence, because, from the nature of the union between the Teeth and sockets, these last can scarcely

* Vide Natural History, page 41, 42, 43. Plate XII.

scarcely be broken farther than the points of the fang, and in very few cases so far ; therefore little mischief can ensue, as the fracture extends no farther than the part of the socket which will naturally decay after the loss of the Tooth ; and that part, which does not decay, will be filled up as a basis for the gum to rest upon. It has been supposed that the splinters do mischief. I very much doubt this ; for if they are not so much detached as to lose the living principle, they still continue part of our body, and are rounded off at their points as all splinters are in other fractures, and particularly here, for the reasons already assigned, viz. because this part has a greater disposition for wasting. And if they are wholly detached, they will either come away before the gum contracts entirely, or, after it is closed, will act as an extraneous body ; form a small abscess in the gum ; and come out.

It sometimes happens that the Tooth is broken, and its point, or more of the fang, is left behind, which is very often sufficient to continue the former complaints ; and therefore it should be extracted, if it can be done, with care. If it cannot be extracted, the gum will in part grow over it ; and the Alveoli will decay as far as where it is. The decaying principle of the socket will produce the disposition to fill up at the bottom, whereby the stump will be pushed out ; but perhaps not till it has

has given some fits of the Tooth-ach. However, this circumstance does not always become a cause of the Tooth-ach.

Transplanting Teeth.

Although this operation is in itself a matter of no difficulty, yet, upon the whole, it is one of the nicest of all operations, and requires more chirurgical and physiological knowledge than any that comes under the care of the dentist. There are certain cautions necessary to be observed, especially if it be a living Tooth which is to be transplanted; because in that case it is meant to retain its life, and we have no great variety of choice. Much likewise depends upon the patient: he should apply early, and give the dentist all the time he thinks necessary to get a sufficient number of Teeth that appear to be of a proper size, &c. Likewise, he must not be impatient to get out of his hands before it is adviseable.

The *Incisores*, *Cuspidati*, and *Bicuspides*, can alone be changed, because they have single fangs. The success is greatest in the *Incisores* and *Cuspidati* than the *Bicuspides*, these last having frequently the ends of their fangs forked; from which circumstance the operation will become less perfect.

It

It is hardly possible to transplant the grinders, as the chance of fitting the sockets of them is very small. When indeed a grinder is extracted, and the socket sound and perfect, the dentist may, perhaps, be able to fit it by a dead Tooth.

Of the State of the Gums and Sockets.

The first object of attention is the Sockets and Gums of the person who is to have the fresh Tooth. If the Tooth, which is to be removed, be not wholly diseased, there is great probability that the Socket will be as sound and complete as ever; but if the body of the Tooth has been destroyed some time, and the fang has been in the state of what is commonly called a stump, it has most probably begun to decay on its outer surface and point; in which case, the Socket will be filled up in the same proportion: if so, there is no possibility of success. But as, in the operation of transplanting, the diseased Tooth is to be first drawn, it will shew the state of the Socket; and the Scion* Tooth is to be left or drawn, according to the appearance on the diseased one.

If

* As the transplanting of Teeth is very similar to the ingrafting of trees, I thought that term might be transferred from gardening to surgery, finding no other expressive of the thing.

If the appearance be not favourable, and it therefore be not probable that the Scion Tooth can be introduced, so as to unite in the place of a Stump, I would recommend to every dentist to have some dead Teeth at hand, that he may have a chance to fit the Socket. I have known these sometimes last for years, especially when well supported by the neighbouring Teeth. Indeed, this very practice is recommended by some dentists in preference to the other. But even this should not be attempted, unless the Socket is sound and pretty large, as the Tooth can otherwise have but very little hold.

Whenever there are Gum-biles, I would not recommend transplanting, as there is always in such cases a diseased socket, although the disease has originated in the Tooth. In one or two instances, indeed, which I have seen, the Bile has been cured by such an operation.

If the Gums are diseased, and become spongy, as has been described, it will be very improper to transplant, as there will be but little chance of success; also, if the Sockets have a disposition to waste, and the Tooth becomes in some degree loose; in short, the Sockets and Gums should be perfectly sound. No person should have a Tooth transplanted, while taking mercury, even although the Gums are not affected by it

at the time; for they may become affected by that medicine before the Tooth is fixed. I would carry this still farther: no one should have a Tooth transplanted, who has any complaint that may subject him to the taking of mercury before the Tooth is well fixed. For this reason, those who have Teeth transplanted, ought particularly to avoid for some time the chance of contracting any complaint, for the cure of which mercury may be necessary.

I would not recommend transplanting, even where mercury has been taken lately. How soon mercury may be taken after a Tooth has been transplanted, is not easily ascertained. I have known it fail from this cause (as it seemed) after six weeks, where there was every reason to suppose that it might have been attended with success.

Of the Age of the Person who is to have the Scion Tooth.

THE Socket should be of its full size, and one or two Grinders on each side of each jaw should be full grown, to keep the two jaws at a proper distance, which will allow the transplanted Tooth to be undisturbed by the motion of the jaw while fastening. This will be at the age of eighteen or twenty years.

It

It sometimes however happens, that a fore Tooth decays before this age, and even before it is completely formed; and therefore all the above-mentioned advantages cannot be had. In such cases, it is not very material whether transplanting is practised or not, as simply to draw the diseased Tooth will in most cases be sufficient; for the two neighbouring Teeth may be brought together, so as to fill up the space, the others following in a less degree, as has been already observed upon irregularities of the Teeth.

Of the Scion Tooth.

The Scion Tooth, or that which is to be transplanted, should be a full grown young Tooth: young, because the principle of life and union is much stronger in such than in old ones.

It will be scarcely necessary to observe, that the new Teeth should always be perfectly sound, and taken from a mouth which has the appearance of that of a person sound and healthy; not that I believe it possible to transplant an infection of any kind from the circulating juices; although we know from experience that it may be done by a matter secreted from them. The Scion Tooth should be less than what the Tooth was, the place of

which it is to supply. This cannot at first be known with certainty, but it may in most cases be nearly ascertained; and that is, by judging from the sizes of the bodies of the two Teeth; but as the fangs do not always bear an exact proportion to the body, it sometimes happens that this method fails. Also, it is not always in our power to judge after this manner; for in some cases the body of the Tooth of the person who is to have one transplanted shall be quite destroyed, the fang only remaining: in these cases we must judge from its correspondent on the opposite side; but even that Tooth is sometimes destroyed.

It has been supposed, that we run no risk by taking the Scion Tooth from a young subject; but this is no security; for a complete Tooth is of the same size in the young as the old*. To remedy this inconvenience as much as possible, the Scion Tooth should be that of a female, for female Teeth are in general smaller than those of men; but the inconvenience still remains, whenever a female is the subject of this operation. Some women have such small Teeth, that it is almost impossible to fit them. When the fang of the Scion Tooth is larger than that which it is intended to supply, it must be made smaller, and only in that part where

* Vide Natural History, page 110, on the Growth of Teeth.

where it exceeds. But the necessity of this should be avoided, if possible; for a Tooth that is filed has lost all those inequalities which allow it to be held much faster. If, however, some part must be removed, it should be done so as to imitate the old Tooth as much as possible. The best remedy is to have several people ready, whose Teeth in appearance are fit; for if the first will not answer, the second may. I am persuaded this operation has failed, from a Tooth being forced in too tight; for let us reflect what must be the consequence of such practice. A part of the soft covering of the Tooth, or lining of the Socket, is squeezed between two hard bones, so that all circulation of juices is prevented; a mortification in that part takes place; and in consequence of that a Gum-bile, and the loss of all union between Tooth and Socket; so that the Tooth drops out.

It will be hardly necessary to mention, that the sooner the Scion Tooth is put into its place the better, as delay will perpetually lessen the power upon which the union of the two parts depends*.

* Vide Natural History of Teeth, page 126, 127, and 128, for an explanation of the principle upon which the success of this operation depends.

Of replacing a sound Tooth, when drawn by mistake.

It sometimes happens, that a Tooth is drawn, on an idea that it is diseased, because it gives pain, but appears after the extraction to be perfectly sound. In such a case I would recommend the replacing it, that there may be no loss by the operation; and the seat of the pain will probably be removed to the next Tooth. A Tooth beat out by violence, should be replaced in the same manner. This ought to be done as soon as possible; however, I would even recommend the experiment twenty-four hours after the accident, or as long as the Socket will receive the Tooth, which may be for some days.

If the Tooth be replaced at any time before its life is destroyed, it will reunite with the cavity of the Socket, and be as fast as ever.

No Tooth is excepted from this practice; for although in the Grinders there are more fangs than one, yet these fangs will as readily go into their respective sockets as one fang would; and most probably, when the Tooth has

has been beat out, the Sockets are enlarged by their giving way.

However, the Grinders are not so subject to such accidents as the fore Teeth, both from their situation, and from their firmness in the Sockets.

Where a Tooth has been only loosened, or shoved out in part, the patient must not hesitate, but replace it immediately. As a proof of the success to be expected from replacing Teeth, I will relate the following case:

A gentleman had his first *bicuspis* knocked out, and the second loosened. The first was driven quite into his mouth, and he spit it out upon the ground; but immediately picked it up, and put it into his pocket. Some hours afterwards he called upon me, mentioned the accident, and shewed me the Tooth. Upon examining his mouth, I found the second *bicuspis* very loose, but pretty much in its place. The Tooth, which had been knocked out, was not quite dry, but very dirty, having dropped on the ground, and having been some time in his pocket. I immediately put it into warm water, let it stay there to soften, washed it as clean as possible, and then replaced it, first having introduced a probe into the socket to break down the coagulated blood which filled it. I then tied these

two Teeth to the first grinder and the *cuspidatus* with silk, which was kept on some days, and then removed. After a month, they were as fast as any Teeth in the head; and, if it were not for the remembrance of the circumstances above related, the gentleman would not be sensible that his Teeth had met with any accident. Four years have now passed since it happened.

Of transplanting a dead Tooth.

The insertion of a dead Tooth has been recommended, and I have known them continue for many years. If this always succeeded as well as the living, I would give it the preference, because we are much more certain of matching them, as a much greater variety of dead Teeth can be procured than of living ones. But they do not always retain their colour, but are susceptible of stain. However, I have known them last for years without any alteration; and some have appeared rather to acquire a transparency, which dead Teeth in general have not.

Of the immediate Fastening of a transplanted Tooth.

When a Tooth has been transplanted, the next thing to be done is to fix it in that position in which it is intended

intended to remain; that is in general to the two neighbouring Teeth, by means of silk or sea-meed. If it is an *Incisor* or *Cuspidatus*, the silk should first be tied to the neck of one of the neighbouring Teeth, as near the Gum as possible; then the two ends of the silk should be brought round upon the body of the Scion Tooth, but not so near the Gum as in the former, and tied there; then it should be brought round the neck of the other neighbouring Tooth, as near the Gum as possible, as in the first, and tied there. The reason of the difference of the heights of the silk recommended, must appear evident, it being our intention to keep the Tooth close to the bottom of the Socket.

If the transplanted Tooth be a *Bicuspis*, the same mode of tying may be followed; but the silk may be brought over its grinding surface between the two points, by which it will be better confined than in any other way. It sometimes happens, that the body of the Scion Tooth is either too long, too thick, or in such a position as to be pressed upon by the Teeth of the opposite Jaw. Great care should be taken to prevent this, as the opposite Teeth constantly oppose the fastening of those which are transplanted, in every motion of the Jaw. To remedy this inconvenience, we have recommended smaller Teeth than those lost; but even when they are of a proper size in other respects, they shall in some

cases still touch the opposite Teeth. When this arises from the length of the Tooth, a small portion may be filed off from the cutting-edge with great safety. If it is owing to the thickness of the Scion Tooth, and in the upper Jaw, some part may be filed off the hollow or concave surface of the Teeth, where the opposite touch. When it is owing to the position of the Tooth, the same thing may be done with propriety. By attending to this circumstance in the tying, this inconvenience may in many cases be prevented; however, if it should not be in the power of the dentist to prevent it by the above-mentioned method, then he should bring them forwards by tying them to a silver plate, a little more bent than the circle of the Teeth, and resting at each end upon the neighbouring Teeth.

Where a Tooth does not exactly fit, but is too short, then there arises a difficulty with the patient, whether he he ought to consult propriety or beauty. The Tooth should be as much in the Socket as it can be with ease; for, although in that case it is too short, appearances must give way.

The patient must now finish the rest. He must be particularly attentive at first, and give it as little motion as possible. In many cases a soreness will continue some

some days, and the Gums will swell; in others there will neither be soreness nor swelling.

The patient must take great care not to catch cold, or expose himself to any of the other common causes of fever; for such accidents are very likely to prevent the success of this operation. This caution is more necessary in winter, than the summer.

The Tooth in some will begin to be fast in a few days, and the Gum will cling close to it; while, in others, many weeks will pass before this happens; though the Tooth may become fixed at last.

I have seen the transplanted Tooth come a little way out of the Socket; and, without any art being used, retire into it as far as at first. The silk is to be removed sooner or later, according as the Tooth is more or less fast; in some people after a fortnight, in others not till some months after the operation.

This operation, like all others, is not attended with certain success. It sometimes happens that the two parts do not unite; and in such cases the Tooth often acts as an extraneous body*, and instead of fastening,

* I say often, because I do not suppose that it always acts as an extraneous body; because we know that dead Teeth have stood for years, without affecting the

the Tooth becomes looser and looser: the gum swells, and a considerable inflammation is kept up, often terminating in a Gum-bile. In some cases, where it is not also attended with success, there are not these symptoms: the parts appear pretty sound, only the Teeth do not fasten, and sometimes drop out.

It also happens, that transplanted Teeth have a very singular operation performed on them while in the Socket; the living Socket and Gum finding this body kept in by force, so that they cannot push it out, set about another mode of getting rid of it, eating away the fang till the whole is destroyed, exactly similar to the wasting of the fangs of the temporary Teeth in the young subject*.

I have all along supposed, that where this practice is attended with success, there is a living union between the Tooth and Socket, and that they receive their future nourishment from this new master. My reasons for supposing it were founded on experiments on other parts†, in animals, and also observations made on the practice itself: for first I observed that they kept their colour, which is very different from that of a dead Tooth;

Sockets or Gums in the least. We may therefore suppose, that it is sometimes the case with transplanted living Teeth.

* Vide Natural History, page 98, Plate X. Fig. 2.

† Vide Natural History, page 126.

Tooth; for a living Tooth has a degree of transparency, while a dead one is of an opaque chalky white.

Secondly, there are instances of their becoming diseased, in the same manner as an original living Tooth; at least the following case favours strongly this opinion.

In *October*, 1772, a gentleman, of the city of *London*, had a Tooth transplanted, which was perfectly sound, and fixed in its new Socket extremely well; about a year and half after, two spots were observed on the fore part of the body of the Tooth, which threatened a decay; they were exactly similar to specks, or the first appearance of decay, which come upon natural living Teeth. Pain is also sometimes felt in the transplanted Tooth.

But what puts it beyond a doubt is, that a living Tooth, when transplanted into some living part of an animal, will retain its life; and the vessels of the animal shall communicate with the Tooth; as is shewn by the following experiments.

I took a sound Tooth from a person's head; then made a pretty deep wound with a lancet into the thick part of a cock's comb; and pressed the fang of the Tooth into this

this wound, and fastened it with threads passed through other parts of the comb. The cock was killed some months after; and I injected the head with a very minute injection: the comb was then taken off, and put into a weak acid, and the Tooth being softened by this means, I slit the comb and Tooth into two halves, in the long direction of the Tooth. I found the vessels of the Tooth well injected, and also observed that the external surface of the Tooth adhered every where to the comb by vessels, similar to the union of a Tooth with the Gum and Sockets*.

* I may here just remark, that this experiment is not generally attended with success. I succeeded but once, out of a great number of trials.

OF

DENTITION.

TEETH, at their first formation, and for some time while growing, are completely inclosed within the Sockets and Gums*, and in their growth they act upon the inclosing parts in some degree as extraneous bodies; for while the operation of growth is going on in them, another operation is produced, which is a decay of that part of the Gum and Socket that covers the Tooth, and which becomes the cause of the very disagreeable and even dangerous symptoms which attend this process. As the Teeth advance in size, they are in the same proportion pressing against these Sockets or Gums, from whence inflammation and ulceration are produced.

That ulceration which takes place in Dentition, is one of the species which seldom or never produces suppuration: however, in some few cases I have found the Gums

* Vide Natural History, page 77 and 78, Plate XII. Fig. 3.

Gums ulcerated, and the body of the Tooth surrounded with matter; but I believe this seldom happens till the Tooth is near cutting the skin of the Gums.

As this is a disease of an early age, and indeed almost begins with life, its symptoms are more diffused, more general, and more uncertain at such an early period, than those of any disorder of full-grown people, putting on the appearance of a great variety of maladies; but these symptoms become less various, and less hazardous, as the child advances in years; so that the double Teeth of the child, and still more so the second set of Teeth, or those of the adult, are usually cut without producing much disturbance.

These symptoms are so various in different children, and often in the same child, that it is difficult to conceive them to be from the same origin; and the varieties are such as seem to be beyond our knowledge.

They produce both local and constitutional complaints, with local sympathy.

The local symptoms we may suppose to be attended with pain, which appears to be expressed by the child when he is restless, uneasy, rubs his gums, and puts every thing into his mouth. There is generally inflam-

mation,

mation, heat, and swelling of the Gums, and an increased flow of saliva.

The constitutional, or general consequential symptoms, are fever, and universal convulsion. The fever is sometimes slight, and sometimes violent. It is very remarkable both for its sudden rise and declension; so that in the first hour of this illness, the child shall be perfectly cool; in the second, flushed and burning hot; and in the third, temperate again.

The partial or local consequential symptoms are the most various and complicated; for the appearance they put on is in some degree determined by the nature of the parts they affect; wherefore they imitate various diseases of the human body. These symptoms we shall describe in the order of their most frequent occurrence.

Diarrhœa, costiveness, loss of appetite, eruptions on the skin, especially on the face and scalp, cough, shortness of breath, with a kind of convulsed respiration, similar to that observable in the hooping-cough, spasms of particular parts, either by intervals or continued, an increased secretion of urine, and sometimes a diminution of that secretion, a discharge of matter from the *penis*, with difficulty and pain in making water, imitating exactly a violent *gonorrhœa*.

The lymphatic glands of the neck are at this time apt to swell; and if the child has a strong tendency to the scrofula, this irritation will promote that disease.

There may be many other symptoms with which we are not at all acquainted, the patients in general not being able to express their feelings. Many of the symptoms of this disease are dangerous, namely, the constitutional ones, and also those local symptoms which attack a vital part. The fever, indeed, seldom lasts so long as to be fatal; but the convulsions, especially when universal, frequently are so. Local convulsions, if not in a vital part, although often very violent, do not kill; and when any part not vital sympathizes, the patient is generally free from danger; a security to the whole being obtained by the sufferings of a part which is of little consequence to life.

Universal sympathy seems to be the first effect of irritation, and in general appears as such in those whose local and partial sensation, and irritability, are not yet formed; for, in such subjects, when one part is irritated, the whole sympathizes, and general convulsions ensue. But as the sensations and partial irritability begin to be formed, each part, in some degree acting for itself, acquires its own peculiarities; so that when a local disease takes place in a patient that is very young,

it

it is capable of giving a general disposition to sympathize; but as the child advances, the power of sympathy becomes partial, there not being now in the constitution that universal consent of parts; but some one part is found which has a greater aptitude than the rest to fall in with the local irritation; therefore the whole disposition for sympathy is directed to some particular part, and it sympathizes according to its own peculiar action. This arises from the different organs acquiring more and more their own independent sensations as the child grows older, and gradually losing the power of sympathizing with one another: so that, by the age of six years, few parts suffer but those immediately affected; and in adults, who cut their Teeth, we almost always find the pain and other symptoms confined to the part, or only local sympathy taking place; such as a swelling of the side of the face.

But as the symptoms become more confined, the suffering part is often much more violently affected, than where it has a power of taking in the other parts. Therefore we find that, in adults, the pain of cutting a Grinder is frequently excessive, and that the local inflammation is very considerable, and often of long continuance*. This is not the case with children; their

* Vide Case the Third.

pain does not appear to be so very considerable, and we are certain that the local inflammation is not great; that it is confined to the very parts which suffer, and is not diffused over the face; so that in children the symptoms of sympathy are often more violent than those of the parts themselves. Though it is generally a fact, that the symptoms of Dentition, in adults, are confined to the parts immediately injured, it is not always or certainly so; for sometimes, as will appear from Case the Fourth, there will be the strongest symptoms imaginable from sympathy; which seems to be owing to a peculiar aptitude in the constitution to universal sympathy. These pains in the adult are often periodical, having their regular and fixed periods, from which circumstance they are often supposed to be aguiſh, and the bark is administered, but without effect. Medicines for the rheumatism are likewise given with as little success; when a Tooth will appear, and disclose the cause of the complaint, and, by lancing the gums, the cure often is performed; but the disease will recur, if the gum happens to heal over the Tooth, which it will very readily do, if the Tooth is pretty deep. As these Teeth are generally slower in their growth than the others, and more especially those which come very late, they become the cause of many returns of the symptoms. How far children under this circumstance are subject to paroxysms of the disease, is not an easy thing

thing to determine; but from many of their sympathetic symptoms going off and returning, it would appear that they have also their exacerbation.

Of the Cure.

The cure of diseases arising from Dentition, from their nature, can only be temporary and local, even when it is directed to the real seat of the disease; and certainly every method of cure which is not so directed, must prove ineffectual, as it can only operate by destroying the effect. Opiates, indeed, will in some degree take off the irritation, by destroying the sensibility of the part; but surely it would be better at once to remove the cause than to be attempting from time to time to remove or palliate the effect. When the sympathy is partial, and not in a vital part, it would be better to allow it to continue than cure it, because it may by such means become universal: for instance, if it is a diarrhœa, the best way is to allow it to go on, or at least only correct it, if too violent, which is often the case. I have seen cases, where the stomach and intestines have sympathized so much, as almost to threaten death. The small quantity of nourishment that the stomach could admit of, was hurried off by the intestines.

Of

Of Cutting the Gums.

As far as my experience has taught me, to cut the gum down to the Teeth appears to be the only method of cure. It acts either by taking off the tension upon the gum, arising from the growth of the Tooth, or by preventing the ulceration which must otherwise take place.

It often happens, particularly when the operation is performed early in the disease, that the gum will reunite over the Teeth; in which case the same symptoms will be produced, and they must be removed by the same method.

I have performed the operation above ten times upon the same Teeth, where the disease had recurred so often, and every time with the absolute removal of the symptoms.

It has been asserted, that to cut the gum once will be sufficient, not only to remove the present, but to prevent any future bad symptoms from the same cause. This is contradictory to experiment, and the known laws of the animal œconomy; for frequently the gum, from

from its thickness over the Tooth, or other causes, must necessarily heal up again, and the relapse is as unavoidable as the original disease.

A vulgar prejudice prevails against this practice, from an objection, that if the gum is lanced so early as to admit of a re-union, the cicatrised part will be harder than the original gum, and therefore the Teeth will find more difficulty in passing, and give more pain. But this is also contrary to facts; for we find that all parts which have been the seat either of wounds or sores, are always more ready to give way to pressure, or any other disease which attacks either the part itself or the constitution. Therefore each operation tends to make the passing of the Teeth easier.

When the Teeth begin to give pain, we find them generally so far formed, as to be easily discerned through the gum.

The fore Teeth are to observed at first, not on the edge of the gum, but on the fore part, making risings there, which appear whiter than the other parts: and it may be observed, that the gums are broader than usual. At this period the incisions must be made pretty deep, till the Tooth be felt with the instrument, otherwise little effect will be produced by the operation: and this

this is the general rule with respect to the depth of the incision in all cases.

When the Grinders shoot into the gum, they flatten the edge of the gum, and make it broad. These Teeth are more easily hit by the instrument than the fore Teeth.

The operation should not be done with a fine-pointed instrument, such as a common lancet, because most probably the point will be broken off against the Tooth, which will make the instrument unfit for going on further, if more incisions are required.

A common lancet, with its point rounded, is a very good instrument; but an instrument, something like a fleam, would be of the most convenient shape.

There is no need of any great delicacy in the operation, the gums being very insensible parts; and to cut through the whole gum down to the Teeth with certainty, when they are pretty deep, requires some force.

The gums will bleed a little, which may be of service in taking off the inflammation. I never saw a case, where the bleeding either proved inconvenient or dangerous.

dangerous. If it ever should be troublesome, I think there could be no great difficulty in stopping it. In general, no application is necessary: the gums soon unite at the most distant part from the Tooth, if it lies deep; and if it be more superficial, the thin gum soon shrinks back over the Tooth, leaving it bare, and decays.

This cutting of the *Dentes Sapientiæ* is often attended with an inconvenience which does not attend the others; and this happens, I believe, only when they come very late, viz. when the jaws have left off growing. This is the want of room in the jaws for these late Teeth; a circumstance which produces an addition to the other inconveniences arising from Dentition. When it takes place in the upper jaw, the Tooth is often obliged to grow backwards; and in such a position it sometimes presses on the anterior edge of the Coronoide Process, in shutting the mouth, and gives great pain. When it takes place in the lower jaw, some part of the Tooth continues to lie hid under that process, and covered by the soft parts, which are always liable to be squeezed between that Tooth and the corresponding Tooth in the upper jaw. To open very freely, is absolutely necessary in these cases: but even this is often not sufficient. Nothing but drawing the Tooth, or Teeth, will remove the evil in many cases.

CASES.

It would be endless to give histories of cases, exemplifying each symptom of Dentition. I shall only relate a few which are singular; and which, being extraordinary, will the better enforce the propriety, in all cases, of the cure I have recommended.

Case I.—A young child was attacked with contractions of the *musculi flexores* of the fingers, and also of the toes. These contractions were so considerable as to keep her fingers and thumb constantly clenched, and so irregularly, that they appeared distorted. All the common antispasmodic medicines were given, and continued for several months, but without success.

I scarified the gums down to the Teeth, and in less than half an hour all the contractions had ceased. This, however, only gave relief for a time. The gums healed; the Teeth continued to grow, and filled up the new space acquired by the scarifications; and the same symptoms appeared a second time.

The former operation was immediately performed, and with the same success.

CASE II.—A boy, about two years of age, was taken with a pain and difficulty in making water; and voided matter from the *urethra*. I suspected that by some means or other this child might possibly be affected by the venereal poison; and the suspicion naturally fell on the nurse.

These complaints sometimes abated, and would go off altogether, and then return again. It was observed at last, that they returned only upon his cutting a new Tooth: this happened so often, regularly and constantly, that there was no reason to doubt but that it was owing to that cause.

CASE III.—A lady, about the age of five or six and twenty years, was attacked with a violent pain in the upper jaw; which at last extended through the whole side of the face, similar to a violent Tooth-ach, from a cold; and was attended with consequent fever.

It was treated at first as a cold; but, from its continuance, was afterwards supposed to be nervous.

The case was represented to me from the country; and I gave the best directions that I could, on a representation of the symptoms.

She came to London some months after, still labouring under the same complaint. Upon examining the mouth, I observed one of the points of the *Dens Sapientiæ* ready to come through. I lanced the gums, and the disorder gave way immediately.

A lady, about the same age, was attacked with a violent pain in the left side of her face. It was regularly periodical, coming on at six o'clock in the evening. She took the Peruvian bark, which had no effect. She took antimonials, and Dovar's powder, which also were equally ineffectual. But one of the points of the *Dens Sapientiæ* of the upper jaw, of the same side, appearing, shewed the cause, and indicated the remedy. The gums were lanced, and the pain ceased.

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THE END.

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EXPLANATION

OF THE

PLATES.

PLATE I.

FIG. I.

A Repreſentation of the under-ſide of the Upper-Jaw, without the Teeth.

a a a a a The outer line of the circle, or what is commonly called the outer plate of the Alveolar proceſs.

b b b The inner line of the circle, commonly called the inner plate.

c c The 10 ſingle Sockets, viz. for the Inciſores, Cuſpidati, and Bicuſpides.

d d The 3 double Sockets for the Molary, or triple-fanged Teeth. The two firſt have three ſockets, and the laſt only two.

Fig. II. A repreſentation of the upper part of the Lower-Jaw, ſhewing particularly the Sockets of the Teeth.

a The Sockets of the ten ſingle-fanged Teeth.

b The ſockets of the 3 double-fanged Teeth.

Fig. 1.

Fig. 2.

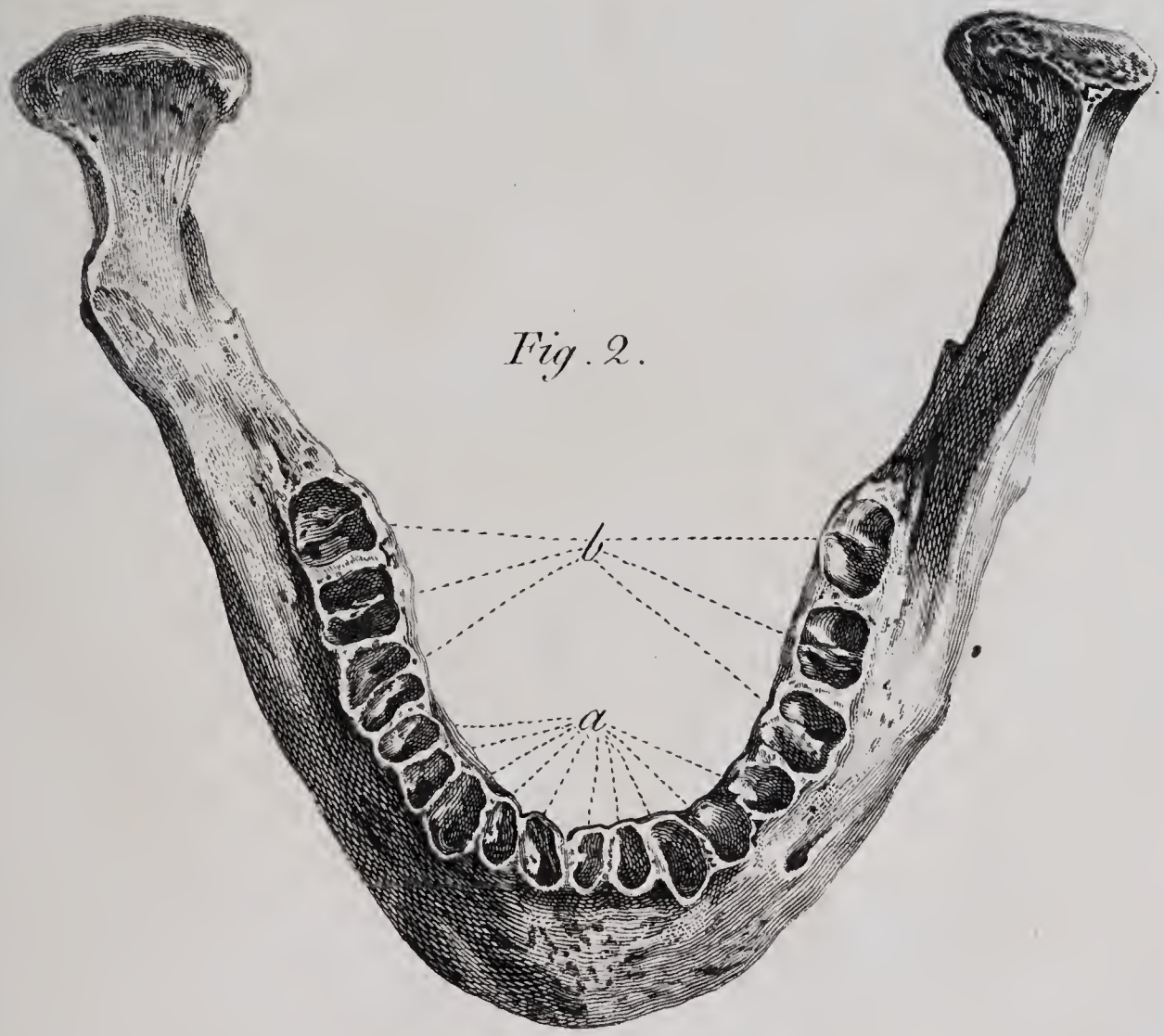

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PLATE II.

A Sketch of the Head to explain what was ſaid of the motions of the Lower-Jaw.

A The Section of the Head which was made to bring the Articulation of the Lower-Jaw into view.

B Lower-Jaw.

C The condyle of the Lower-Jaw.

D The occipital condyle of the Head.

E F The Digaſtric Muſcle.

E Its origin.

F Its inſertion.

G G G The *Vertebræ* of the Neck.

H The *Meatus Auditorius externus.*

I The hollow, or cavity in the temporal bone for the articulation of the Lower-Jaw.

K The eminence before that cavity, likewiſe for articulation.

L The moveable cartilage of the Joint.

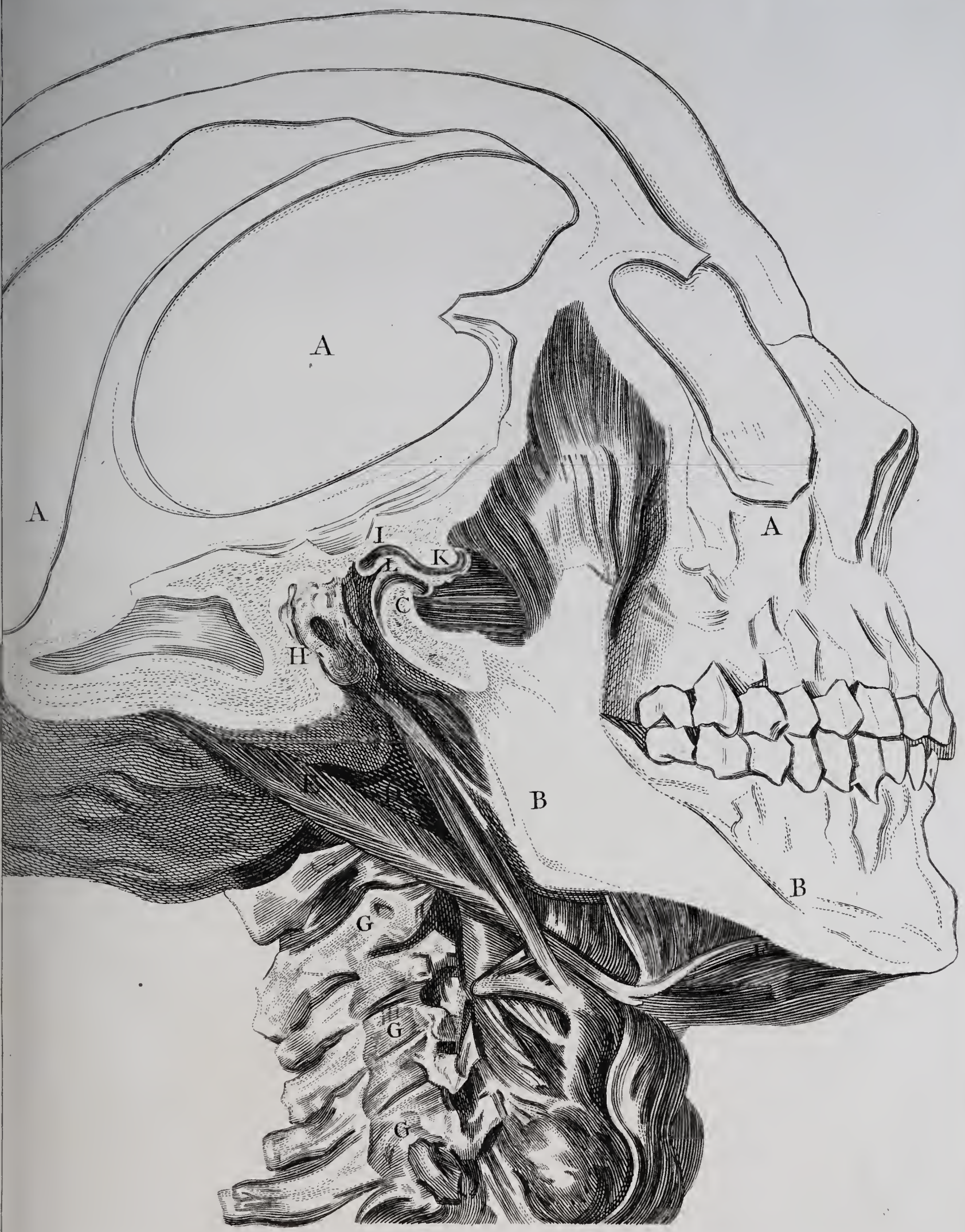

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PLATE III.

Fig. I. A front view of the Upper and Lower-Jaws of an adult, with a full ſet of Teeth.

a a a a a The Upper-Jaw.

b b Its attachment to the check-bones below the orbits.

c c The Lower-Jaw.

Fig. II. A ſide view of both Jaws in the ſame ſtate.

A A A A The Upper-Jaw.

B B The body of the Lower-Jaw.

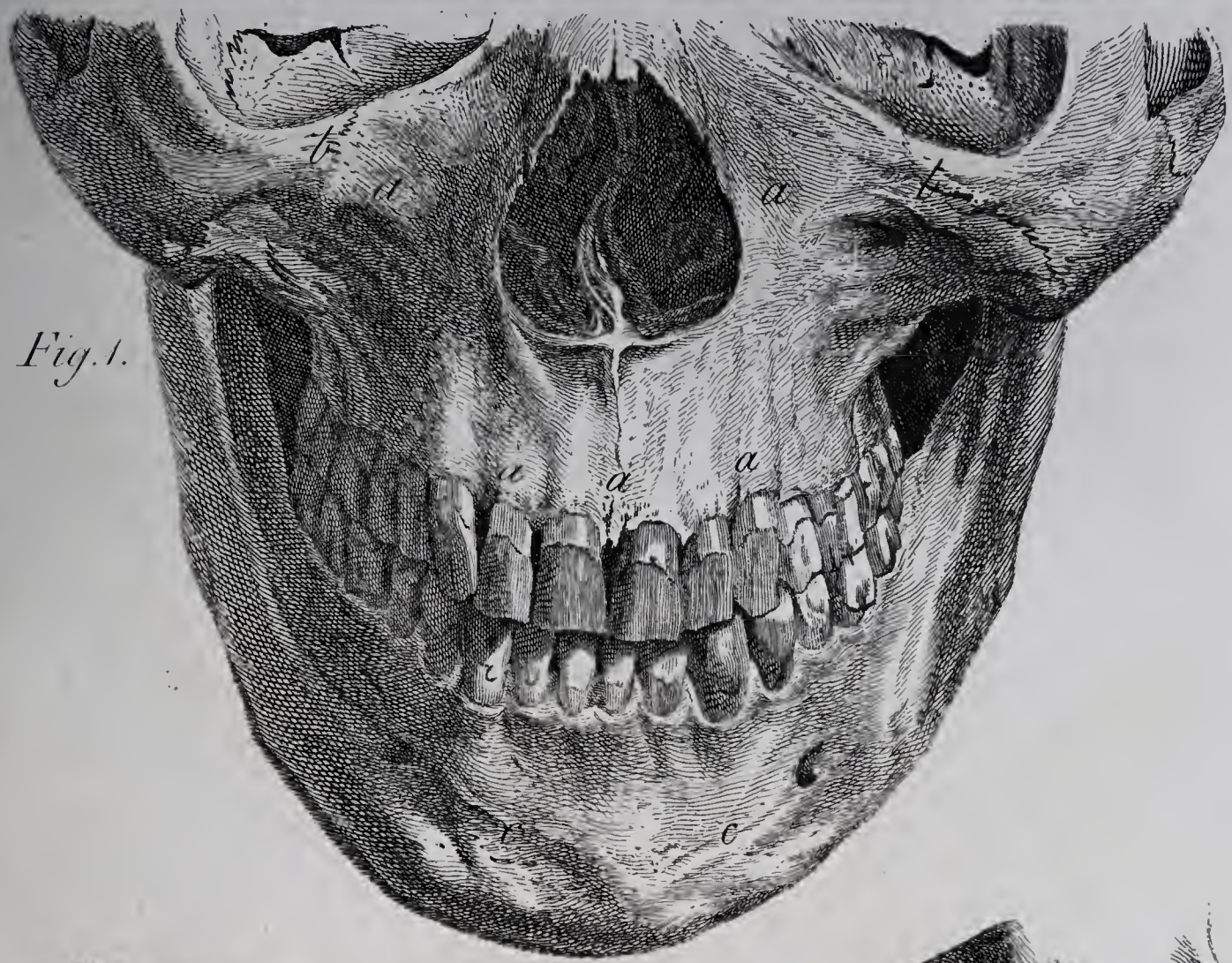
C Its aſcending proceſs.

D The Root of the Coronoid Proceſs.

E The Condyle.

F F F F The fluted Alveolar Proceſſes.

Fig. 1.



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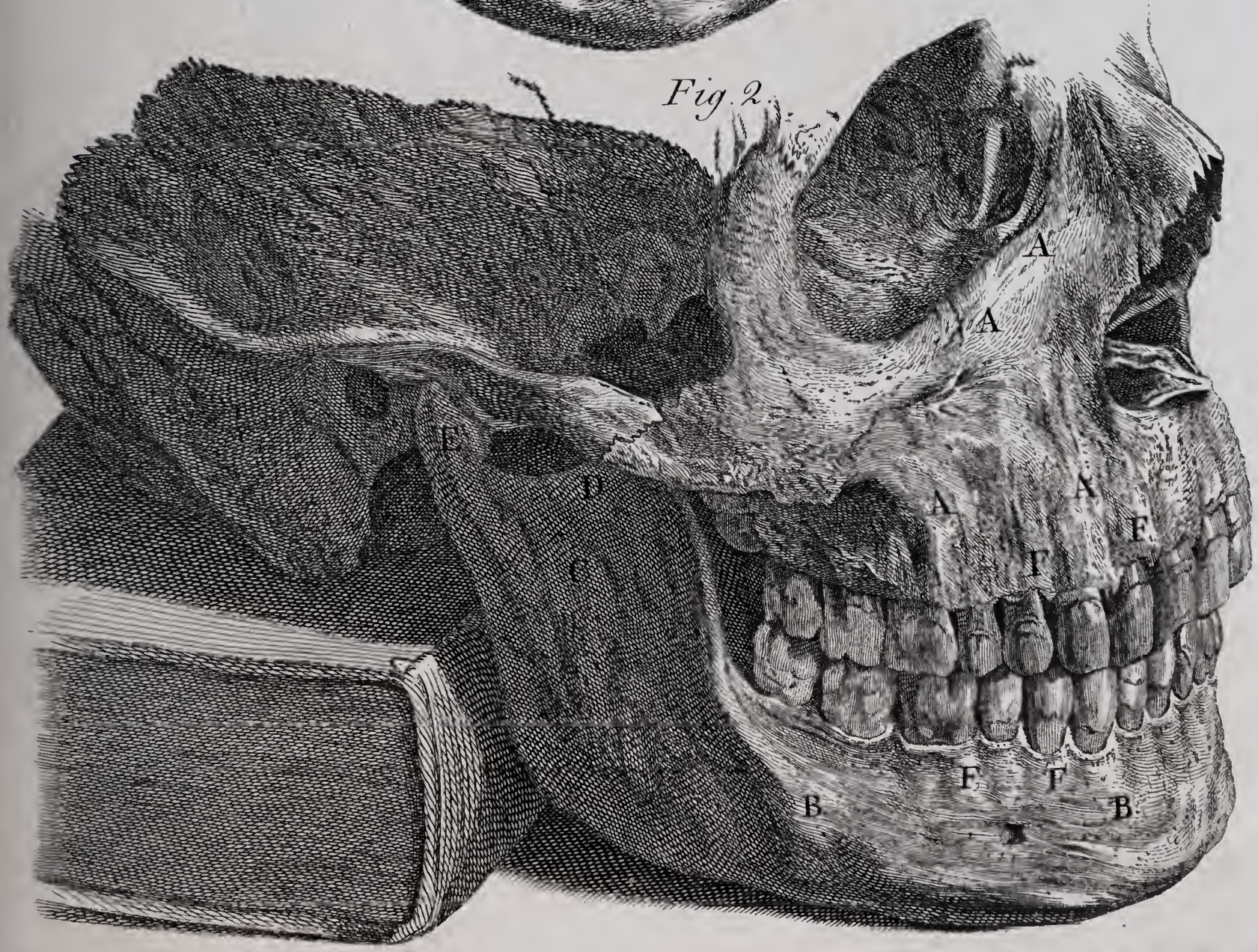

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PLATE IV.

Fig. I. The baſis of the ſkull, and of the Upper-Jaw, with a full ſet of Teeth; ſhewing the cutting edges and grinding ſurfaces of the Teeth of the Upper-Jaw, and the cavity and eminence of the temporal bone for the articulation of the Lower-Jaw.

a a a a The four *Inciſores.*

b b The two *Cuſpidati.*

c c The four *Bicuſpides.*

d d The ſix Grinders.

e e The two cavities in the temporal bones for the articulation of the condyles of the Lower-Jaw.

f f The two eminences upon which the condyles move, in many actions of that bone.

Fig. II. A view, from above and behind, of the Lower-Jaw, with a full ſet of Teeth; ſhewing the cutting edges and grinding ſurfaces of the Teeth in that Jaw, with the Coronoid Proceſſes, and condyles for articulation.

a a a a The four *Inciſores.*

b b The two *Cuſpidati.*

c c The four *Bicuſpides.*

d d The ſix Grinders.

e e The Coronoid Proceſſes.

f f The Condyles.

Fig III. The moveable cartilage of the joint of the Lower-Jaw.

a The cut ſurface of a longitudinal ſection of it. The lower and concave ſurface is what is articulated with the Condyle; the upper and convex ſurface is what is in contact with the Temporal Bone.

Fig. 1.

Fig. 2.

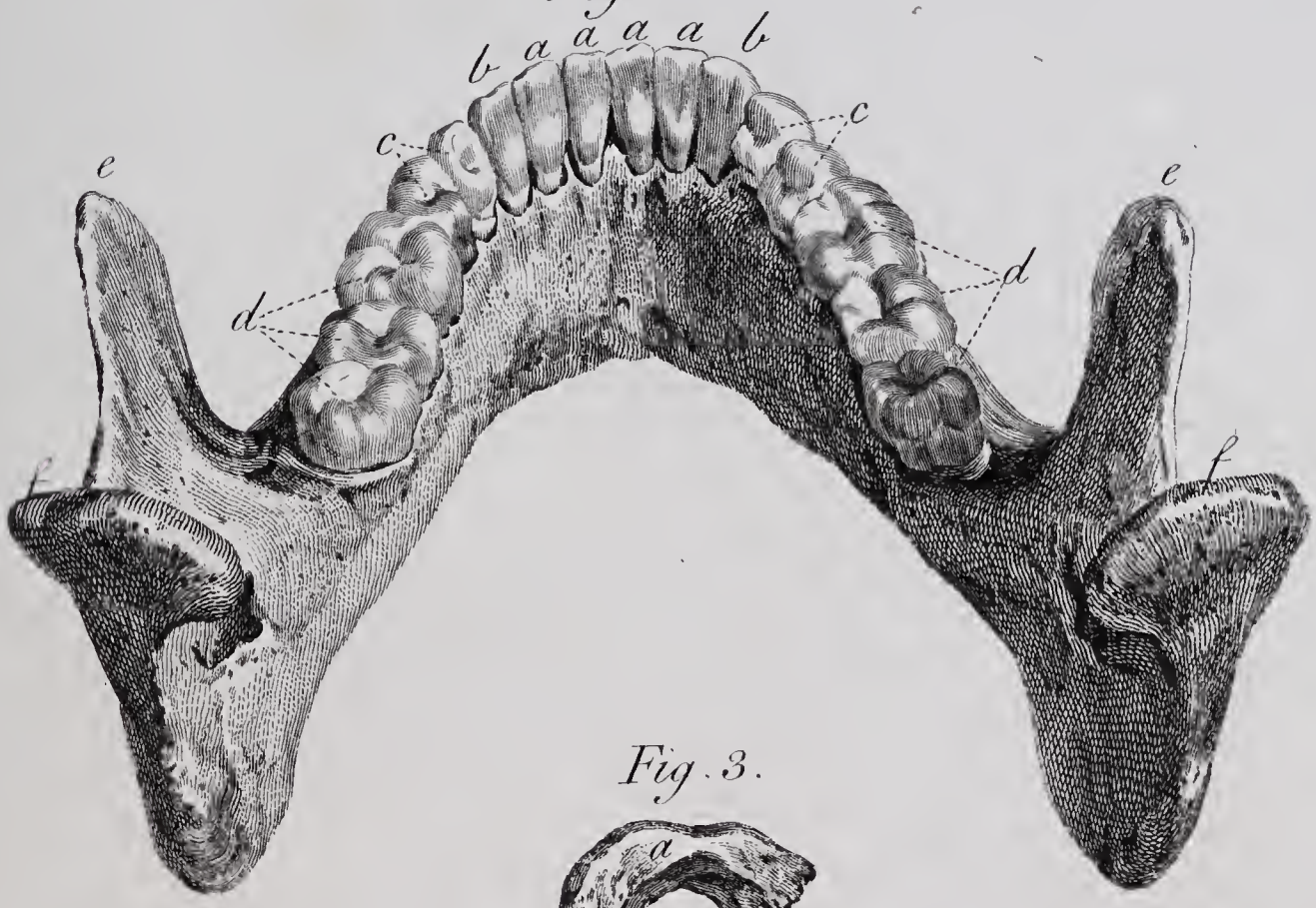

Fig. 3.

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PLATE V.

Two views of the ſixteen Teeth of one ſide of both Jaws, taken out of their ſockets to expoſe the whole of each Tooth.

Row 1. The Teeth of the Upper Jaw, ſeen from the outſide.

Row 2. The ſame view of the Teeth of the Lower-Jaw: the five ſingle are ſimilar to thoſe in the Upper-Jaw, but the Grinders in this have only two fangs.

a a The two *Inciſors*.

b The *Cuſpidatus*, ſhewing in the ſame view how much it is longer than the others.

c c The *Bicuſpides*.

d d The two firſt Grinders, having three fangs.

e The third Grinder, or *Dens Sapientiæ* having alſo three fangs.

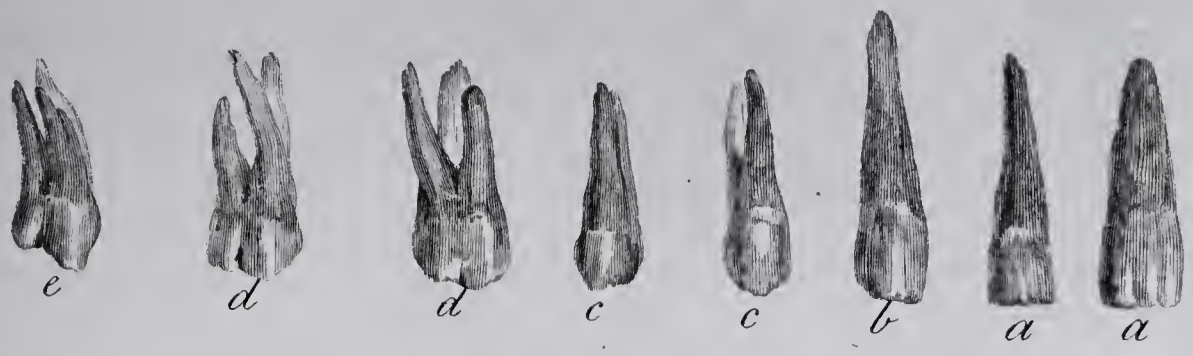
Row 3 and 4. A ſide view of the ſame Teeth, ſhewing that the *Inciſores* and *Cuſpidati* in this view differ from the former view more than the *Bicuſpides* or Grinders.

Row 3, *a a* The two *Inciſores* of the Upper-Jaw, ſhewing the hollowed inner ſurface of the body of thoſe Teeth.

b The *Cuſpidatus*, ſhewing the ſame.

c c The *Bicuſpides*, ſhewing the two points on the baſis of each. The firſt of them has a forked fang.

Row 1.



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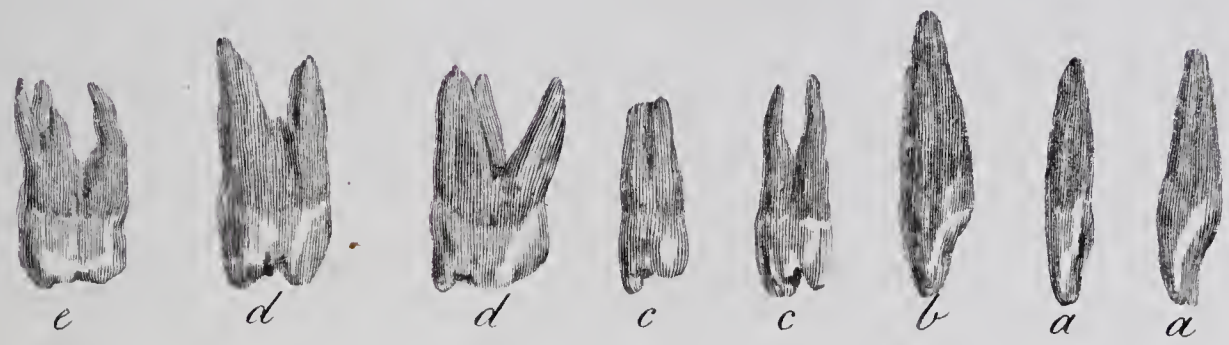

Row 4.

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PLATE VI.

Fig. I. A ſide view of the Upper and Lower-Jaw, in which the outer plate of the Alveolar Proceſs was taken off to expoſe the Fangs of the Teeth in their ſockets. The length of each fang is at once ſeen with reſpect to its neighbour, and this kind of articulation pointed out at one view.

Fig. II. A view of the inſide of the Teeth of both Jaws in their natural ſituation when the mouth is ſhut. In this view the ſpectator's eye is ſuppoſed to be placed behind and below the two Jaws.

Fig. 1.

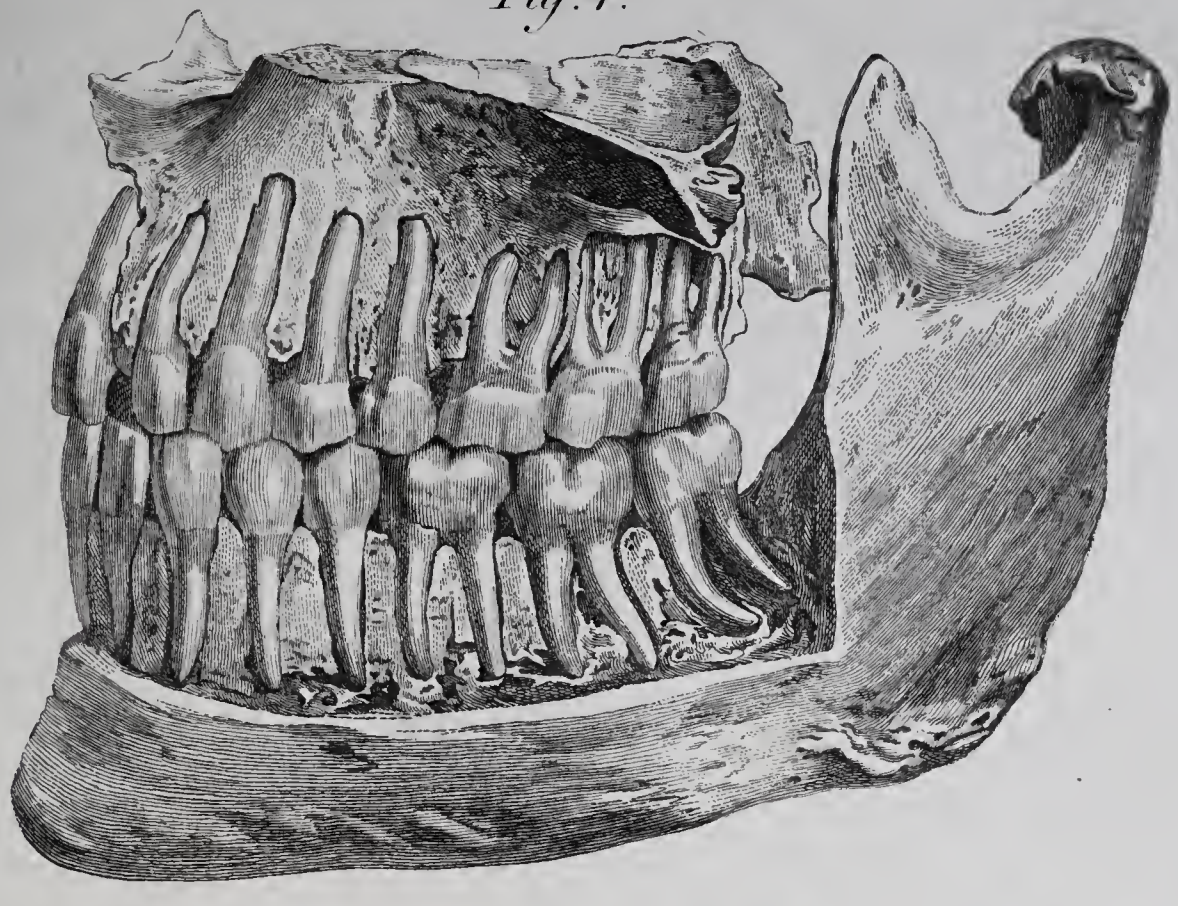

Fig. 2.

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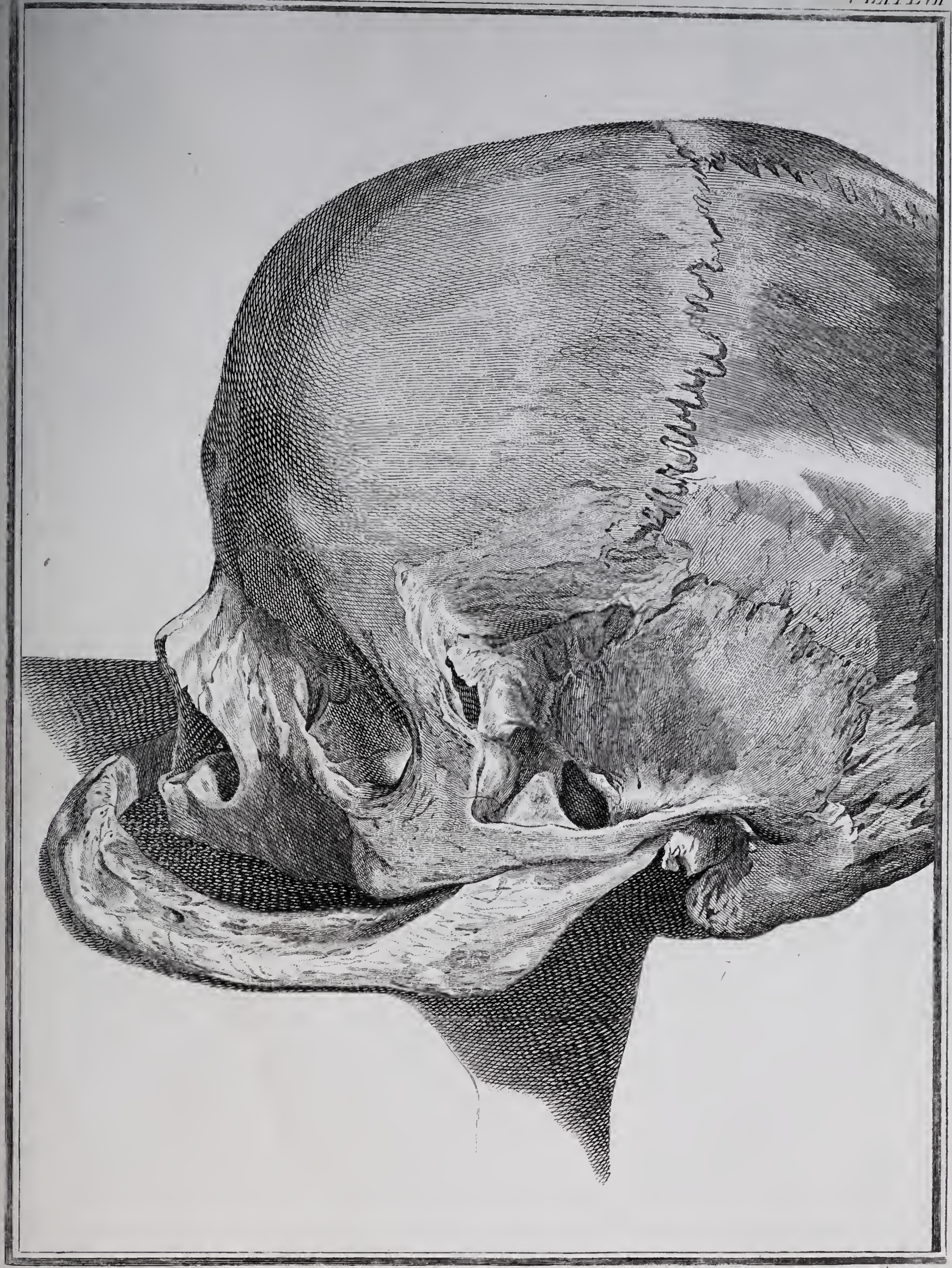
PLATE VII.

The bones of the head of a very old woman, who had loſt her Teeth a conſiderable time before death. The whole Alveolar Proceſſes are gone in both Jaws, which allows of the Lower-Jaw being raiſed about two Inches higher than what is common in ſhutting the mouth, before the gums of both Jaws can come into contact; by this increaſed motion of the Lower-Jaw, the chin is brought more upon a line with the articulation, therefore projects beyond the Upper-Jaw conſiderably.



J. Van Riemsdyk fecit.

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T. Poggeon fc

PLATE VIII.

This plate ſhews the gradual growth of the two Jaws, eſpecially of the Alveolar Proceſſes.

Fig. I. and II. One ſide of the Lower and of the Upper-Jaw of a Fœtus about three or four months old.

a a The groove which is afterwards formed into Sockets.

Fig. III. and IV. One ſide of the Lower and of the Upper-Jaw of a Fœtus about ſix months old, at which age (*a a*) ſome of the partitions have ſhot acroſs near the anterior part, forming diſtinct cells.

Fig. V. and VI. The Upper and Lower-Jaw of a new born child, ſhewing the laſt mentioned circumſtance in a more advanced ſtate.

Fig. VII. The Lower-Jaw of a child ſeven or eight months old, in which the two firſt *Inciſores* had cut the gum, ſhewing the ſockets of ſix Teeth.

a a The mouths of the Alveoli contracted over the Teeth, eſpecially thoſe of the Grinders, where they have not yet begun to open for the paſſage of the Teeth.

Fig. VIII. A ſketch of an Upper-Jaw where the *Cuſpidatus* of that ſide had been formed high up in the Jaw, and therefore never could appear through the Gum. *a* The fang of the *Cuſpidatus*. *b* Its body contained in the Upper-Jaw and Alveolar Proceſs.

Fig. IX. A ſketch of the Upper-Jaw of a child, where the *Cuſpidatus* was inverted, ſo that its point was turned up againſt the Jaw, and the growing mouth of its cavity towards the Gum. *a* The point of the *Cuſpidatus* turned up againſt the Jaw. *b* The open and growing part of the Tooth which ſhould be formed into a fang.

Fig. X. The out-line of the Lower-Jaw of a child, to ſhew that the Condyle is then nearly on a line with the Gums.

Fig. 1.

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PLATE IX.

Fig. I. One ſide of the Upper and Lower-Jaw of a ſubject about eight or nine years of age, where the *Inciſores* and *Cuſpidati* of the Fœtus were ſhed, and their ſucceſſors riſing in new ſockets; ſhewing likewiſe the two Grinders of the child, with the *Bicuſpides* forming underneath. The firſt adult Grinder was ready to cut the Gum; and the ſecond Grinder in the Lower-Jaw is lodged in the root of the Choronoid Proceſs, and in the Upper-Jaw it is in the tubercle.

Fig. II. Part of the Lower-Jaw cut through at the ſymphyſis. The *Inciſor* of the child is ſtanding in its ſocket, and the adult *Inciſor* forming in a diſtinct ſocket underneath.

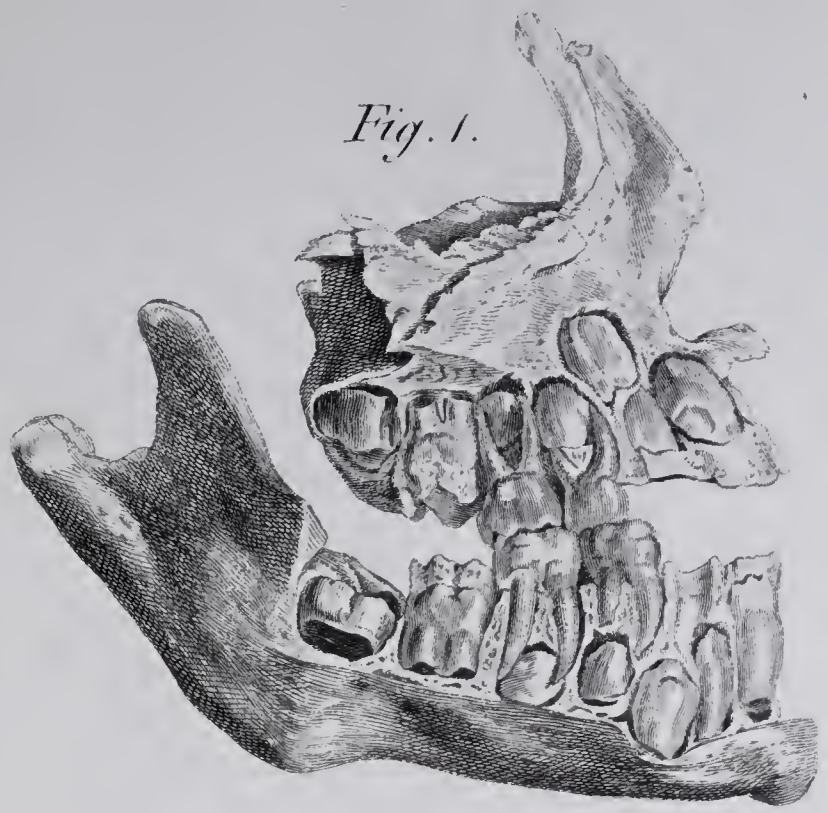
Fig. III. Another view of the ſame piece of the Jaw, to ſhew that the *Bicuſpides* are formed in diſtinct ſockets of their own, and not in the ſocket of the Grinder which ſtands above.

Fig. IV. The five Teeth in the half of each Jaw of a Fœtus of ſeven or eight months, ſhewing the progreſs of oſſification from the firſt *Inciſor* to the ſecond Grinder.

Fig. V. The ſame teeth ſomewhat farther advanced.

Fig. VI. The Teeth of a child of eight or nine years of age, ſhewing the five temporary Teeth in a more advanced ſtate, with the firſt adult Grinder. The adult *Inciſores* and one *Cuſpidatus* are alſo begun to be formed.

Fig. 1.



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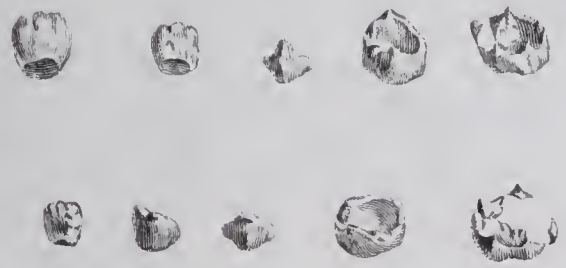

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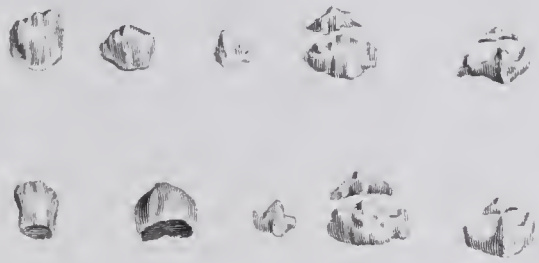

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PLATE X.

Fig. I. The Teeth of one ſide of both Jaws, from a child of five or ſix years of age. B B,C C The temporary Teeth almoſt completely formed. A D, Seven, viz. four above and three below, of the ſucceeding Teeth ſeen at the roots of the firſt ſet. E E, The body of the firſt adult Grinder nearly formed.

Fig. II. The Teeth of one ſide of both Jaws, from a child of ſeven years of age. This is an age in which there are more Teeth formed and forming than at any other time of life. B B, C C, The ten temporary Teeth complete. A D, Ten incomplete to ſucceed them. E E, Two adult Grinders; making twenty-two in this ſide, and of courſe forty-four in the whole. *a a a a*, The Fangs of the temporary *Inciſors* beginning to decay at their points.

Fig. 1.

Fig. 2.

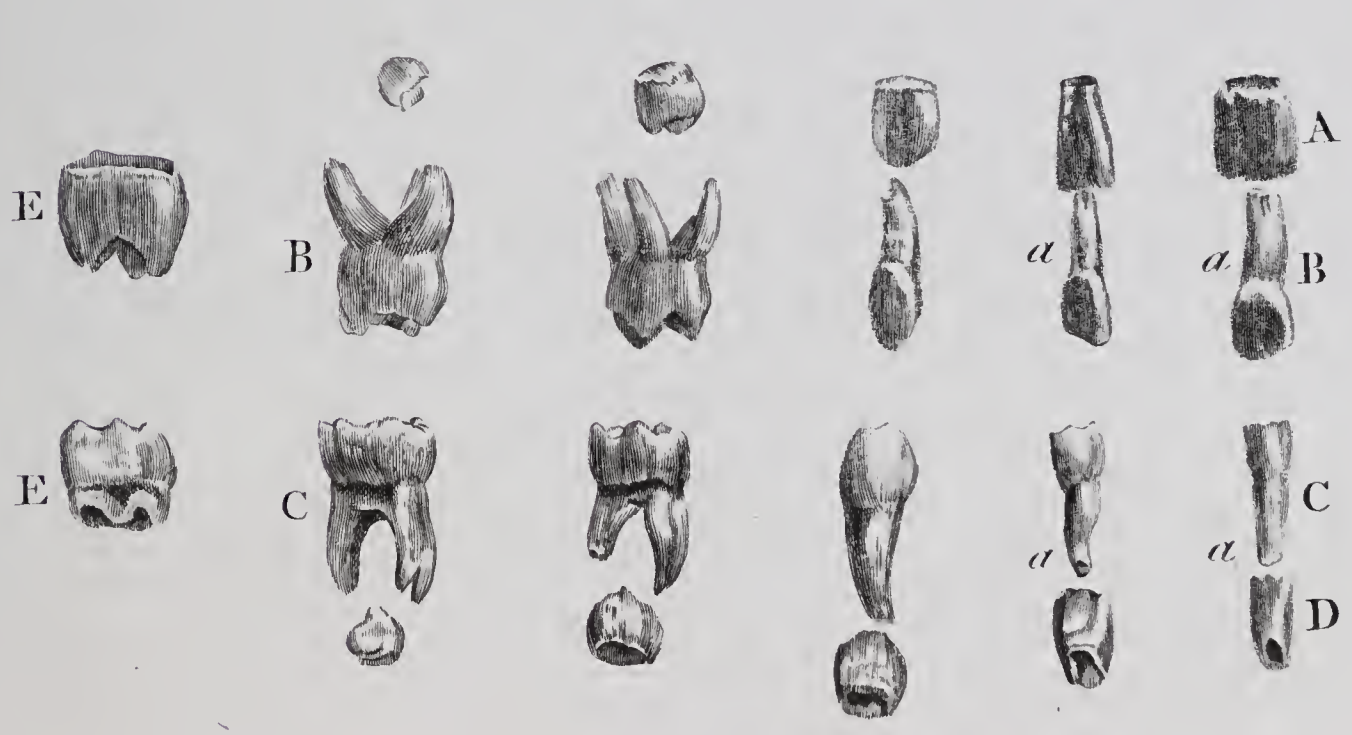

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PLATE XI.

Fig. I. The Teeth of a child eight or nine years old; principally to ſhew the progreſs of the ſecond Set, and the beginning and decay of the firſt Set.

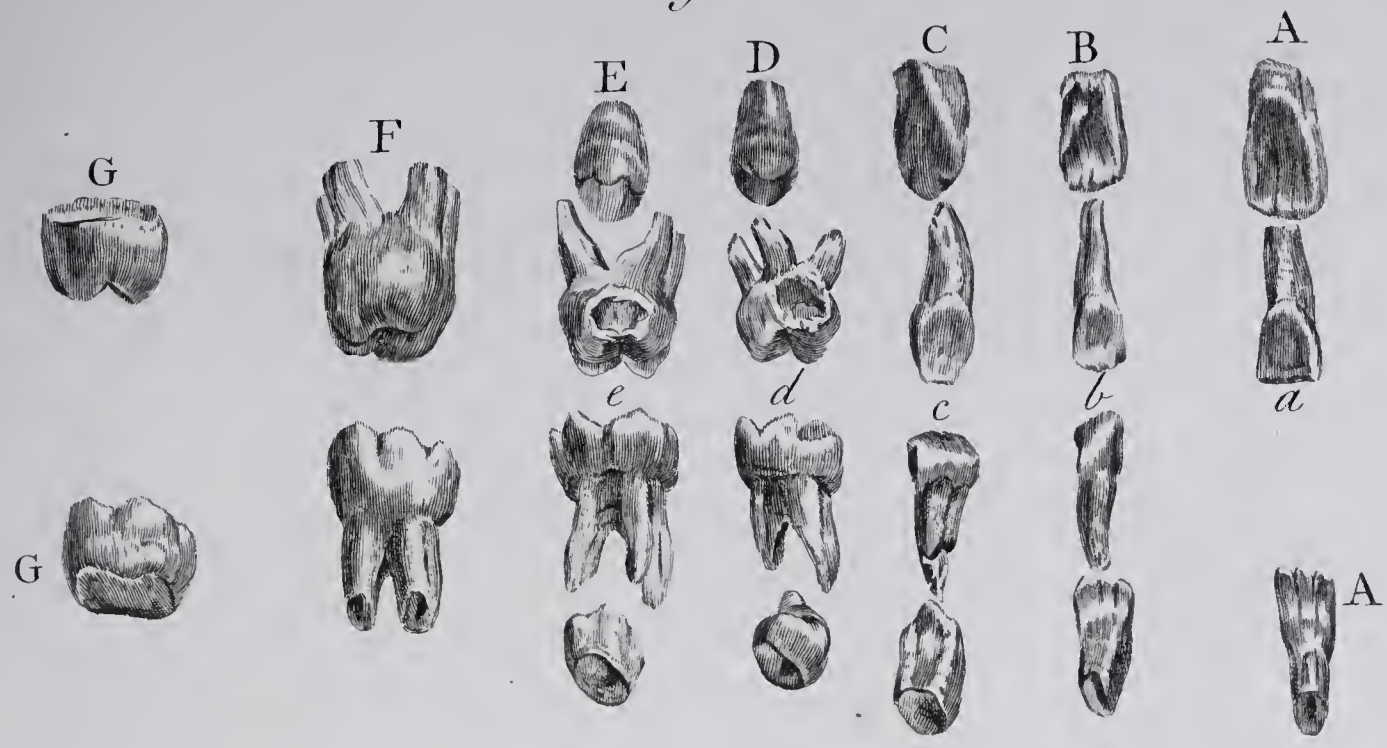
A A, The firſt *Inciſores* of the ſecond or permanent Set. B. The ſecond *Inciſor*. C. The *Cuſpidatus*. D E, The *Bicuſpides*. F G, The two firſt *Molares*.

a b, The temporary *Inciſores*, the firſt of which in the lower Jaw is wanting, having been ſhed. *c*, The *Cuſpidati*. *d e*, The temporary *Molares*.

Fig. II. The Teeth of a youth about eleven or twelve years old, ſhewing the farther progreſs of the one Set towards perfection, and of the other in their decay.

a a a a, The *Inciſores* of the ſecond Set, which had all cut the Gum. *b b*, The Baſis of the third *Molaris* or *Dens Sapientiæ*. *c c*, The remaining *Molares* of the firſt Set, with decayed Fangs. *d d*, The two firſt *Molares* of the ſecond Set, ſo much advanced that they had cut the Gums.

Fig. 1.



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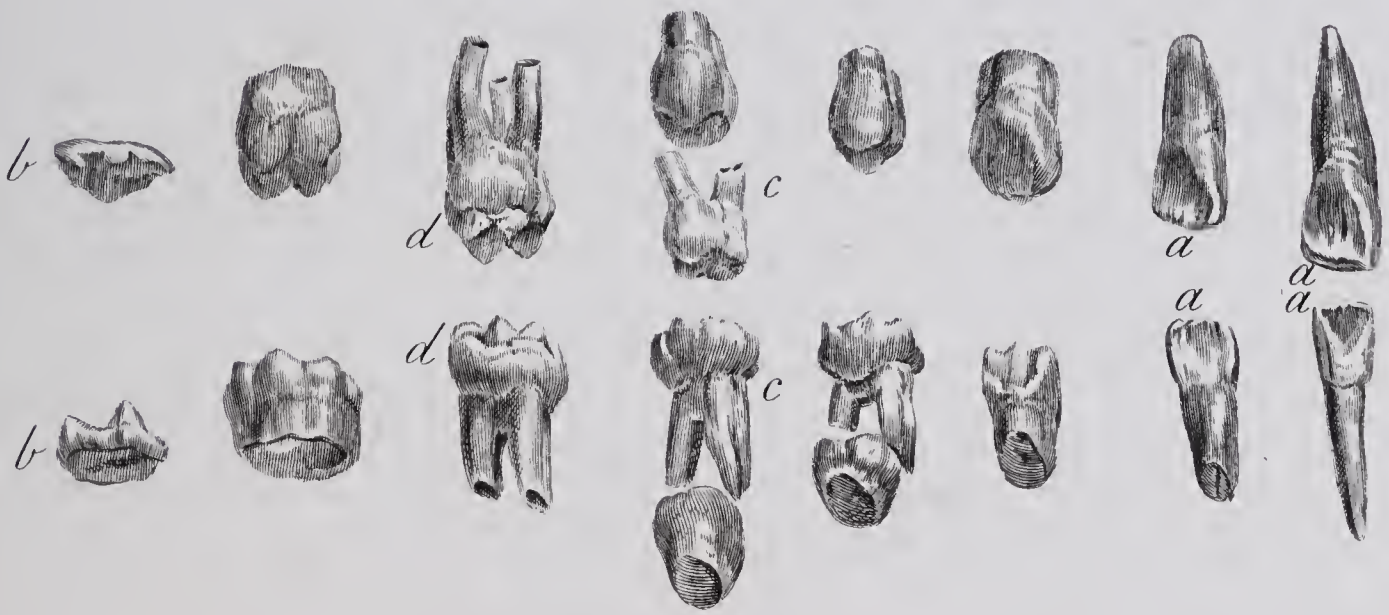

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PLATE XII.

Fig, I. The Lower-Jaw of a Fœtus, from which part of the Gum and bony ſocket is taken off, to expoſe the membrane which incloſes the Teeth. *a*, The upper edge of the gum. *b b b*, The membrane which covers the Teeth.

Fig. II. The Upper-Jaw of the ſame Fœtus, ſhewing the ſame membrane in that Jaw.

Fig. III. The Lower-Jaw of a new-born child, where this incloſing membrane is opened, to ſhew the bodies of the Teeth that were covered by it. The blood veſſels which run in its ſubſtance are alſo expoſed.

a, The body of the Tooth. *b*, The membrane.

Fig. IV. That part of the Jaw and Gum which contains the *Cuſpidatus*. The whole is a little magnified. The membrane is opened and turned off on each ſide, and the fore part is turned down. The upper part of the pulp is covered with its bony ſhell, which is ſeen by its want of veſſels.

a, The oſſified part of the Tooth. *b*, The pulp. *c c*, The membrane opened and turned back.

Fig. V. and VI. Two pulps magnified. Fig. V. The pulp of the *Cuſpidatus*, Fig. VI. That of the Grinder. The oſſifications are removed, to ſhew that the pulp is of the ſame ſhape with the Tooth which is formed upon it. As far down on the pulp as the veſſels are ſeen, the oſſification had advanced; which ſhews that it is more vaſcular where the operation of oſſification is going on. The lower ragged edge, *a*, is part of the capſula turned down.

Fig. 7. One of the Grinders of the Lower-Jaw, ſawed down to expoſe the two cavities or canals leading to the body of the Tooth, where they unite, and form a ſquare cavity. In theſe two canals are ſeen two arteries, which run on to the common cavity, and there ramify. The veins are not injected. The whole is magnified.

In the body of the Tooth may be obſerved a number of ſtrata, each of which is loſt in the circumference of the Tooth.

a a, The Jaw-bone and Gum cut through. *b*, The body of the Tooth. *c c*, The two fangs. *d d*, The arteries running into the cavities of the fangs.

Fig. VIII. An *Inciſor* prepared and magnified in the ſame manner, ſhewing the ſame circumſtances in that Tooth.

Fig. 1.

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PLATE XIII.

Fig. I. Shews the formation of the cavity and fangs of the Molares. The upper row are thoſe of the Lower-Jaw, and the lower thoſe of the Upper. A A, *a a*, is the common cavity in the body of the Tooth, which in the 2d, *a a*, is deeper than in the firſt. B ſhews the bony arch thrown over the mouth of the cavity, and dividing that into two openings which give origin to the two fangs. C D E, The progreſs of theſe fangs. F, a *Molaris* of the Upper-Jaw, where the mouth of the cavity is a little tucked in, at three different points, from which three oſſifications ſhoot. G ſhews theſe oſſifications, and the beginning of three fangs. H I K, ſhews the gradual growth of theſe fangs.

Fig. II. Is a comparative view of the Inciſors and Grinders of the child and adult; for the better underſtanding of which they are ſawed down the middle, ſhewing in a ſide view the gradual increaſe of theſe Teeth. The uppermoſt row is of the child, and the lower of the adult. *a b c d*, Shew the gradual growth of the body, fangs, and cavity of the of *Inciſors* both ages. *e f g*, Shew theſe circumſtances in the Grinders.

Fig. III. 1, 2, 3, 4, 5, 6, 7, ſhewing the gradual growth of a ſingle Tooth, from its firſt formation nearly, to its being almoſt complete.

Fig. 1.

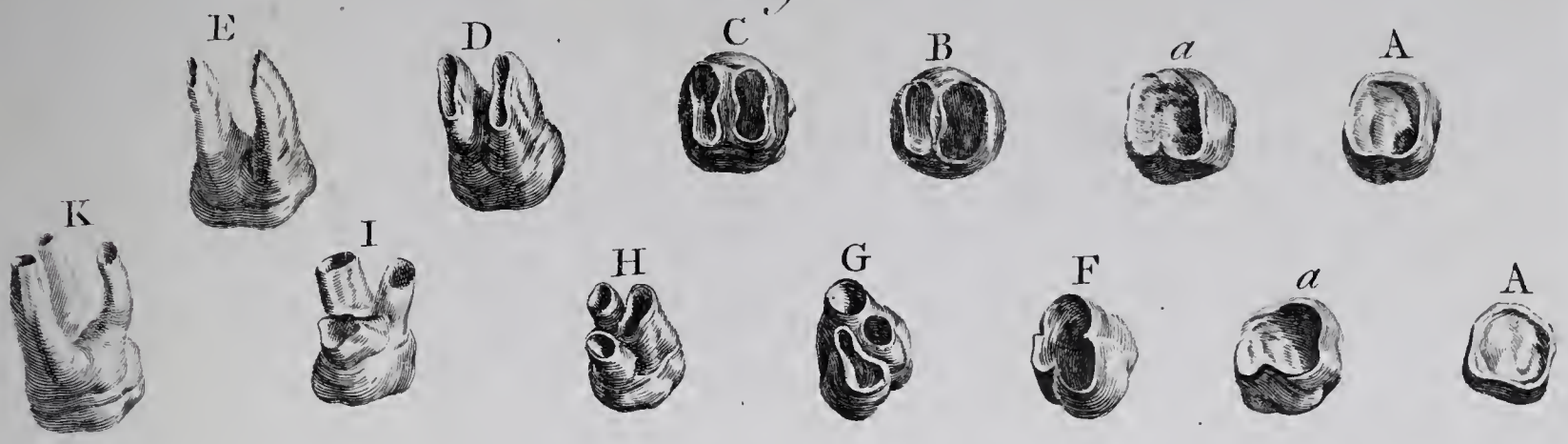

Fig. 2.

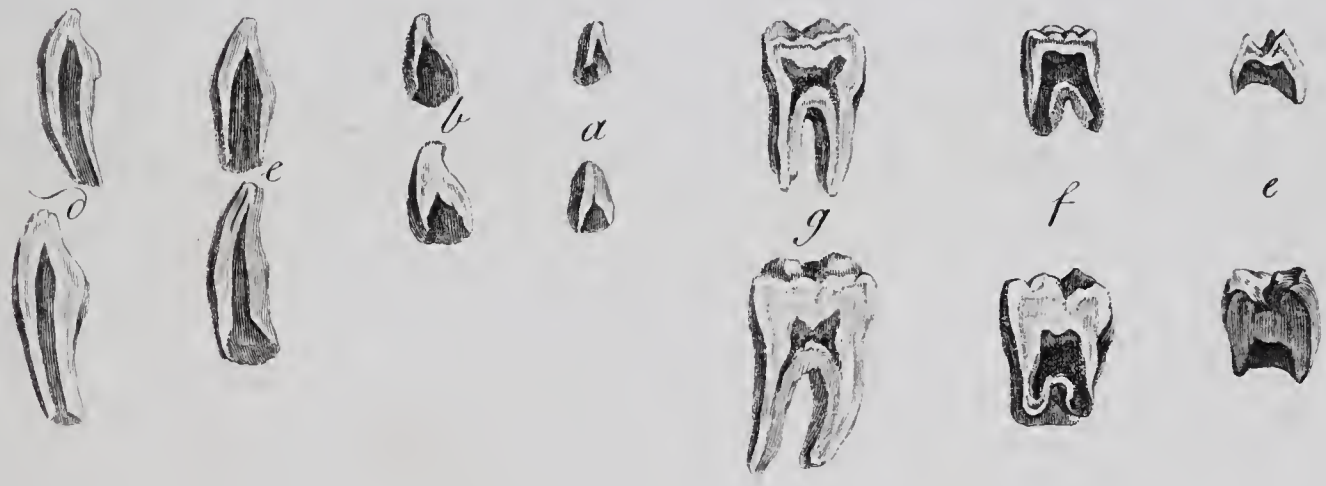

Fig. 3.

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PLATE XIV.

Fig. I. II. III. IV. V. and VI. Shew the cavities of the Teeth in the *Inſciores*, *Cuſpidatus*, *Bicuſpidatus*, and *Molares*.

Fig. VII. A *Molaris* of the Lower-Jaw, with part of its fangs ſawed off, to ſhew that the ſides of the cavity or canal have grown together, and divided it into two ſmall canals, which are repreſented by the two dark points.

Fig. VIII. and IX. The cavity in the body of the Teeth ſeen in tranſverſe ſections.

Fig. X. and XI. Longitudinal ſections of the *Molares* to expoſe the cavities.

Fig. XII. The baſis of a *Molaris* whoſe points were worn down, and the bony part which projected into thoſe points expoſed.

Fig. XIII. A *Molaris*, whoſe bony part is wholly expoſed, and only a circle of Enamel left covering the ſides all round.

Fig. XIV. and XV. A lateral view of the Enamel of a *Molaris* and a *Bicuſpis* cut longitudinally.

Fig. XVI. A *Cuſpidatus* worn ſo much down, as to expoſe the whole end of the bony part, a circle only of Enamel remaining.

Fig. XVII. An *Inciſor* ſlit down its axis, to ſhew the Enamel upon the body of the Tooth, covering much more of the convex than of the concave part.

Fig. XVIII. An *Inciſor*, ſhewing the ſame as Fig. XVI.

Fig. XIX. A horſe's Tooth ſlit down its whole length, to ſhew how the Enamel is intermixed with the bony part, and that it paſſes through the whole length of the Tooth. The Enamel is repreſented by the white lines, which are peniform, ſhewing the ſtriated texture of the Enamel.

Fig. XX. The grinding ſurface of a horſe's *Molaris*, to ſhew the irregular courſe of the Enamel.

Fig. XXI. An *Inciſor* a little magnified, ſlit down its middle, to ſhew that the Enamel is ſtriated, and that the *Striæ* are all turned towards the centre.

Fig. XXII. A Grinder in the ſame ſtate, to ſhew the ſame circumſtances.

Fig. XXIII. The baſis of a *Molaris* broken through, ſhewing that the Enamel is ſtriated in this view alſo, and that all the *Striæ* point to the centre. N. B. The Teeth muſt be broken to ſhew theſe facts.

Fig. XXIV. An old Tooth, whoſe baſis has been worn down below the original termination of the cavity in the body of the Tooth, and that end has been filled up, in the ſame proportion, with new matter, to prevent the cavity being expoſed. This matter is of a darker colour, as repreſented in the figure.

Fig. XXV. Another Tooth in the ſame ſtate.

Fig. 1.

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PLATE XV.

Fig. I. A horſe's Tooth that was juſt ready to be ſhed. The three parts of the Tooth which ſtand up *a a a* incloſed the riſing end of the young Tooth. This is all that was left of a long Tooth.

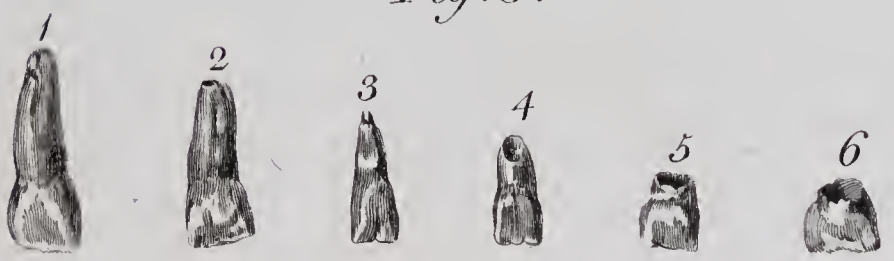
Fig. II. A ſeries of Grinders of the child, from their being complete to their utmoſt decay. *a* is a Grinder of the Upper-Jaw nearly complete, in which the three fangs are almoſt formed. *b* has ſome of its fang abſorbed, *c* more, *d* ſtill more, *e* nearly all gone, and *f* the whole of the fangs gone, only the neck and body remaining.

Fig. III. A ſeries of *Inciſores* in the ſame ſtate. No. 1. A complete formed Tooth. 2. The fang ſomewhat decayed. 3. More ſo. 4. Still more. 5. The fang almoſt gone: and, 6. the whole fang gone, the neck and body only remaining.

Fig. 1.

Fig. 2.

Fig. 3.



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of Bottles